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Industry Power

A Putman Publication "Executive Magazines for Industry"

JULY 1957

For Men Who Manage

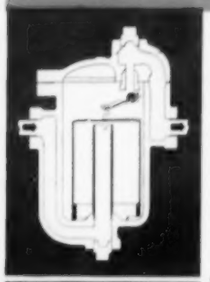
Power Services

IDLEWILD officially opens — central heating showplace...page 14

ARE WE RUNNING OUT OF WATER?

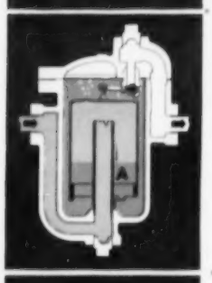
ROBERT H. MORSE, JR., PRESIDENT / Fairbanks, Morse & Co.

How Armstrong Trap Design Improves Plant Efficiency . . .

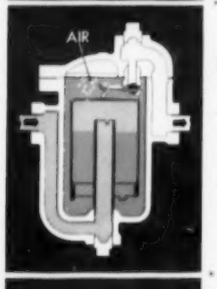


1 When trap is first installed, the inverted bucket is down and the valve is wide open. The large clearance between valve and seat minimizes restriction to condensate flow, contributing to large capacity.

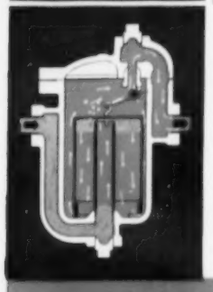
2 When steam is turned on, note how condensate (solid color) flows down between bucket and trap body, then up and out through orifice. Dirt is held in suspension and washed out when valve opens.



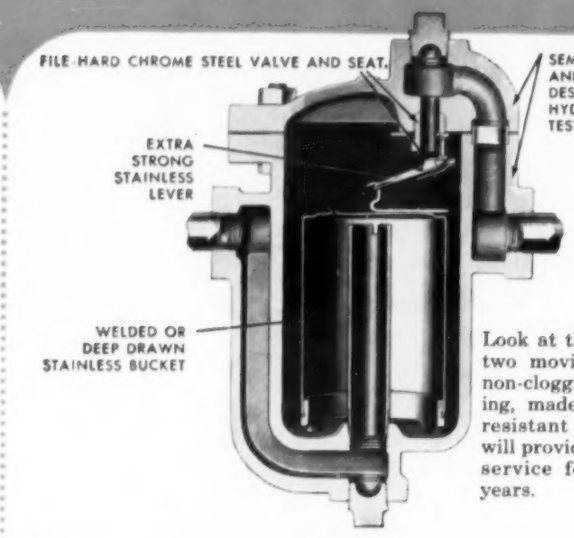
3 When steam reaching trap displaces less than ⅔ of the water in the bucket, it floats, closing the valve. Generous safety margin (dimension A) insures that steam will never reach trap orifice.



4 When more condensate enters trap, the bucket loses buoyancy and pulls on valve lever. (Note how incoming air passes through bucket vent and collects at top of trap, awaiting discharge.)



5 When weight of bucket times leverage overcomes pressure on valve, trap opens, creating momentary pressure drop that "pumps" condensate and non-condensibles from unit being drained.


FILE-HARD CHROME STEEL VALVE AND SEAT.
SEMI-STEEL BODY AND CAP. 250 LBS. DESIGN PRESSURE—HYDROSTATIC TESTED AT 500 LBS.
EXTRA STRONG STAINLESS LEVER
WELDED OR DEEP DRAWN STAINLESS BUCKET

Look at this trap. Only two moving parts. It's non-clogging, non-sticking, made of corrosion resistant materials. It will provide trouble-free service for years and years.

Time-Tested Inverted Bucket Principle Provides Five Cost-Reducing Benefits:

The modern Armstrong Trap is unsurpassed in these five major contributions to plant operating efficiency:

1. Fast heat-up—thanks to large condensate and air handling capacity. On batch or cycled production, you get maximum output per day.

2. High heat transfer rate—quick opening creates a sudden surge of condensate and air from the unit being drained. This pumping action prevents stratification of incondensibles and insures complete drainage. Laboratory and field tests prove it produces higher heat transfer than is otherwise possible.

3. Low Fuel Consumption—non-productive radiation losses are minimized because condensate is discharged at steam temperature as fast as it accumulates in the trap—you get more production per hour and per unit of fuel. And, there is no steam loss through the trap orifice.

4. Continuity of operation—the trap always opens for condensate; the simple, sturdy, self-cleaning mechanism insures continuous operation between inspections without interruption of processing.

5. Low Maintenance—no trap has ever gained so enviable a record for trouble-free service—ask anyone who has kept records.

Free: Steam Trap Book—
44 helpful pages on trap selection, installation maintenance, physical data and prices. Call your local Armstrong Representative or Distributor, or write:

ARMSTRONG MACHINE WORKS
8201 Maple Street • Three Rivers, Michigan

ARMSTRONG Inverted Bucket STEAM TRAPS

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Industry Power

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Advertising Representation will be found on page 55

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A PUTMAN PUBLICATION

Industry Power

FOR MEN WHO MANAGE POWER SERVICES

VOLUME 73 NO. 2 JULY 1957

In this issue...

are we running out of water? 13

Vital yet often overlooked problem of inadequate water supplies in this country indicates that we are not keeping pace with our growing water needs. Industry must share the burden of water conservation.

space heating at Idlewild 14

$6 million central plant supplies all heat for Idlewild's new passenger buildings. International La Mont-type boilers supply high temperature water in this pace-setting heating system.

operate diesel engines on crankcase drain oil 16

Using reclaimed crankcase drain oil as diesel fuel cuts operating costs, conserves otherwise wasted energy. Purification process solves problem of removing contaminants.

no smoke or odor problems at Oakland's incinerators 20

Municipal incinerators handle all refuse including tin cans and glass. Suspending refractory from structural steel framework simplifies maintenance, increases refractory life.

cooling at Idlewild 22

High-temperature water is generating medium for Carrier Corp. lithium bromide refrigeration machines. Chilled water distribution requires four miles of underground piping.

monthly features...

news of industry	4	guide to engineering literature	32
this month's comment	10	coming events	52
news in photos	18	advertising index	53
new products	26	the locator	53

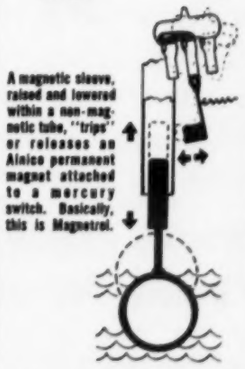
Safer because it's Simpler

■ Of all boiler water level controls, we believe Magnetrol to be the safest. Certainly it is the simplest.

A PERMANENT Alnico magnet, located *outside* the float chamber, links boiler water level and electrical controls. This infallible magnetic link eliminates mechanical parts normally subject to wear and fatigue failure. *Pioneered and perfected by Magnetrol,* it provides almost unlimited operating life.

The brass "No-Scale" float chamber liner, another exclusive Magnetrol feature, is self-cleaning. It actually "flexes" off scale and prevents "sticking" of the float.

These are just two of *many* advances for greater boiler safety found *only* in Magnetrol. *Standard* Magnetrol units are available for temperatures up to 750°F., at pressures up to 600 psi, for single stage (low water cut-off) or multi-level stage (pump control *plus* low water cutoff and alarm) service with as many as three separate switching actions. Special units are available for more extreme requirements.


A magnetic sleeve, raised and lowered within a non-magnetic tube, "trips" or releases an Alnico permanent magnet attached to a mercury switch. Basically, this is Magnetrol.

MAGNETROL, Inc.

Mail the Coupon Now for the Facts

MAGNETROL, INC., 2130 S. Marshall Blvd., Chicago 23, Ill.
Gentlemen: Please send me Catalog Section III and full information on Magnetrol Boiler Water Level Controls.

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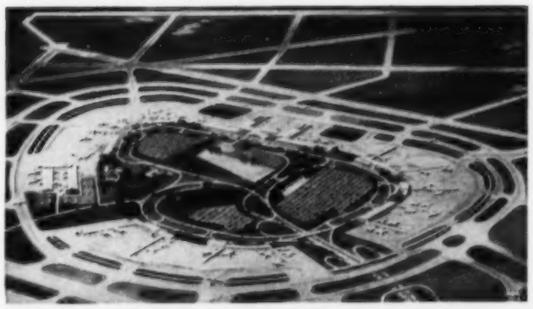
1ST. CHOICE in the AVIATION INDUSTRY

for More Efficient, Economical High Temperature Water Generation

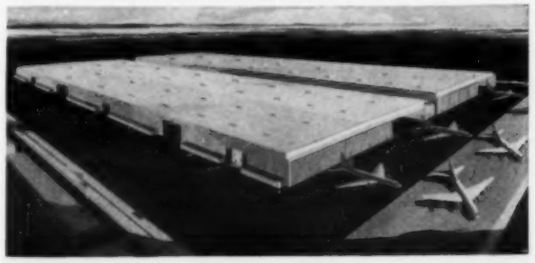
International-LaMont HTW Generators are taking care of the year-round heating requirements of the sprawling New York International Airport, and the new Douglas DC-8 plant among many other industrial and commercial installations.

More and more engineers are specifying high temperature water (350°F. to 400°F.) systems employing International-LaMont Forced Recirculation Generators. Featuring a built-in counterflow economizer that preheats return water, these modern units permit temperature differentials of up to 200°F. with attendant economies in installation, operation and maintenance.

For full information, we invite you to write for* Bulletin 700 *today.



The 655-acre Terminal City of New York's new multimillion dollar International Airport is heated with four International-LaMont HTW Package Generators with a total capacity of 160,000,000 Btu/hr. Two additional Generators (32,000,000 Btu/hr.) will serve the separate needs of the American Airlines facility at Idlewild.



The ultra-modern Douglas DC-8 jet transport will soon emerge from this million square foot Long Beach, Calif. plant. All heating is done with three International-LaMont HTW Generators chosen for their proven efficiency and economy.

IBW BOILER BUILDERS SINCE 1886

THE INTERNATIONAL BOILER WORKS CO.

850 Spruce St. East Stroudsburg, Pa.

Steel Firebox Heating & Power Boilers Low & High Pressure Water Tube Package Boilers • International-LaMont Forced Recirculation Generators • ASME Code Pressure Vessels & Welded Products.

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Ip news

Holifield says AEC claim on fallout is misleading

Relations between AEC and Congressional subcommittee currently holding hearings on radioactive fallout are anything but harmonious. AEC recently issued statement saying 'clean' bombs have reduced fallout to minimum, indicates it is not major problem. But Rep. Chet Holifield, subcommittee chairman, says AEC statement is misleading because it gives false sense of security regarding fallout dangers. Holifield also charged AEC with ignoring suggestions of AEC Commissioner Thomas E. Murray that instead of bigger A-bombs, this country should concentrate on producing smaller weapons for "brush fire" wars.

Landis is nominated to head ASME

James N. Landis, vice president of Bechtel Corporation, San Francisco, is new ASME presidential nominee. He will be installed to head the 50,000 member professional society during the ASME annual meeting next December in New York.

Radio pioneer receives AIEE Lamme medal

Dr. Harold H. Beverage, vice president, research and development, RCA Communications, Inc., is the 1956 Lamme Gold Medal award winner of AIEE for "pioneering and outstanding achievements in conception and application of principles basic to progress in national and worldwide radio communications." Award was given at AIEE's annual meeting June 24 in Montreal.

AIEE names new officers at Montreal meeting

Walter J. Barrett (see News in Photos) becomes new president of AIEE at the society's annual meeting June 24 in Montreal, Canada. Other new officers include vice presidents Benjamin R. Teare, Jr., Carnegie Institute of Technology; Herbert W. Oetinger, Duke Power Co., Charlotte, N. C., Albert G. Johnson,

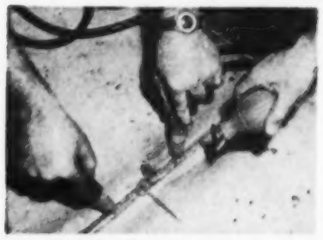
Omaha Public Power District, Omaha, Neb., Orien A. Gustafson, General Electric Co., San Francisco; and Gordon F. Tracy, University of Toronto.

L. F. Hickernell, Anaconda Wire & Cable Co., Hastings-on-Hudson, N. Y., is new treasurer.

Directors elected are: Edwin W. Morris, Westinghouse Electric Corp., Los Angeles; William R. Clark, Leeds & Northrup, Philadelphia; and Julius C. Strasbourger, Cleveland Electric Illuminating Co., Cleveland.

Navy tests welds with magnetic particles

Small surface cracks in finished welds on heavy ship plates are hard to detect with x-rays. Photo shows Navy technicians making



magnetic particle test on a weld (for longitudinal defects) with Portaflux unit. Rubber squeeze bottle spreads a special metal powder that indicates irregularities in magnetic field when cracks are present. Instrument is manufactured by Phillips Electronics, Inc., Mt. Vernon, N. Y.

ASA conference to talk about cost-profit squeeze

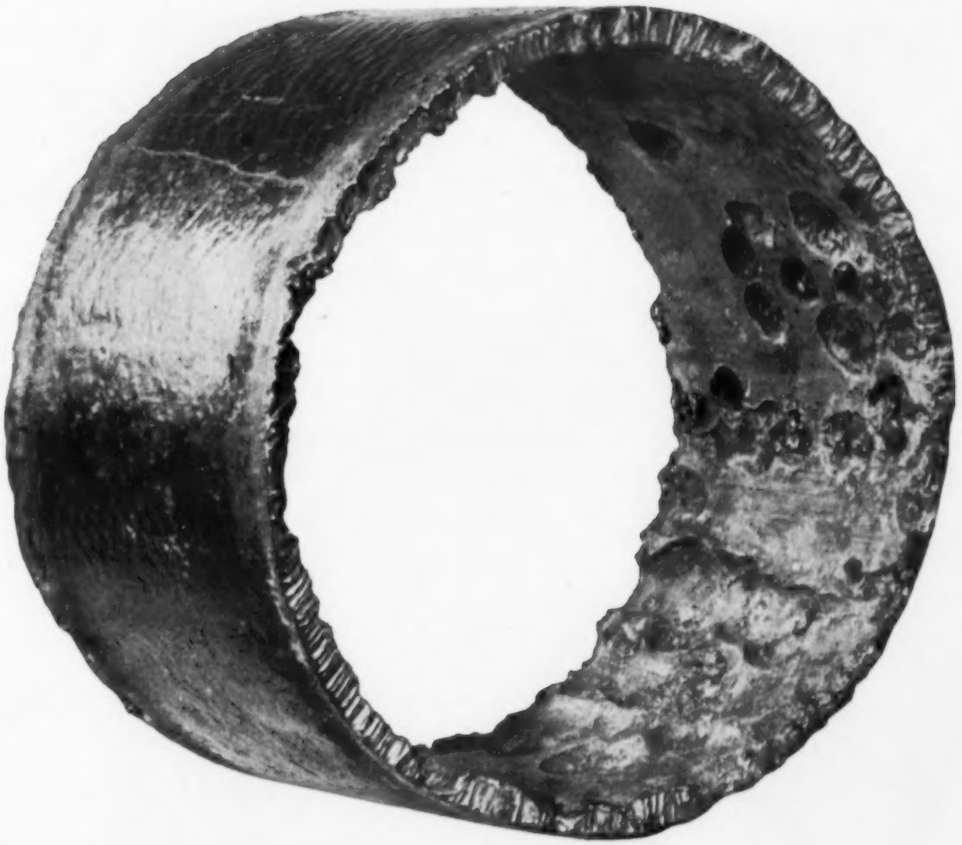
How to beat the cost-profit squeeze now harrassing business and industry will be subject of the 8th National Conference on Standards, set for San Francisco's St. Francis hotel November 13-15. Conference will meet in conjunction with American Standards Association annual meeting, will be presided over by H. Thomas Hallowell, Jr., president, Standard Pressed Steel Co., and ASA head.

AEC announces plutonium price schedules

Chairman Lewis L. Strauss says AEC established price to July 1, 1962 for plutonium produced by licensed power and research reactors in this country will range from $30 to $40 per gram depending on plutonium 240 content. 1954 Atomic En-

(more on page 6)

Unretouched photo showing typical return line corrosive action resulting from carbonic acid and dissolved oxygen in condensate.



BREAKING DOWN WITHIN

This section of pipe looks like new—on the outside. But take a look inside. Grooving action caused by carbonic acid and deep pitting, the result of dissolved oxygen attack, have almost completely penetrated the pipe wall.

Dearborn FILMEEN* prevents such destruction. FILMEEN forms a protective, non-wettable barrier between treated steam, or condensate, and metal pipe surfaces. By preventing the carbonic acid and dissolved oxygen from coming into contact with the metal, FILMEEN assures corrosion-free lines. FILMEEN is only one of many Dearborn water conditioning products scientifically developed to control specific corrosion problems. Others eliminate scale, sludge, carry-over and similar difficulties.

Power engineers in leading industrial and commercial plants place their confidence in Dearborn's 70 years of experience in water chemistry. They have found the answer to the demand for complete plant protection in Dearborn Supervisory Service—a properly balanced water conditioning program which combines quality products with correct, technically supervised control methods and test procedures.

Let a Dearborn Engineer survey your plant and recommend the type of water control program best suited to your requirements.

**FILMEEN is the trade-mark of a corrosion-inhibiting compound patented and produced exclusively by Dearborn Chemical Company. U.S. Pat. No. RE 23614.*

Dearborn®

...a leader in water conditioning and corrosion control for 70 years

Dearborn Chemical Company
Merchandise Mart Plaza, Dept. INP, Chicago 54, Ill.

Gentlemen: ☐ Have a Dearborn Water Conditioning Engineer call.
☐ Send me complete information on Dearborn Water Conditioning Program.

Name.....*Title*.....

Company.....

Address.....

City.....*Zone*.....*State*.....

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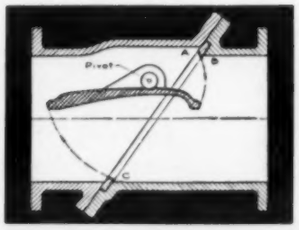
You have to see it to believe it . . .

(You Can't Hear It!)

CHAPMAN Tilting Disc Check Valve

It's the silent valve. No noise, no vibration, no fluttering. On usual piping arrangements you get no slamming with a Chapman Tilting Disc Check Valve. You get no banging to cause damage to system or valve . . . no grinding, scraping or wearing of either the disc or seat. Your maintenance costs go down to an unbelievable low which is really something to see and enjoy.

You can safely use these valves under tough operating conditions. You can order them in iron and steel . . . for handling fluids or gases under a wide range of pressures. You can get them fast. See our Catalog 30-A. Write for your copy today.



Look at this operational chart. When the flow is on, "airfoil" disc is held firmly against stops in the body. When the flow drops, disc balances quietly on whatever flow there is. When flow stops, disc drops quickly, quietly and firmly on special bevel seat. Note that sufficient space is designed around disc to cut down flow resistance.

THE CHAPMAN VALVE MANUFACTURING CO.
INDIAN ORCHARD, MASSACHUSETTS

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IP news

ergy Act gives AEC authority to establish fair price for domestic plutonium. Principal application of price schedule is for power reactors since research reactors produce little plutonium.

York-Shipley buys Michigan furnace firm

Purchase of the furnace division, Jackson & Church Co., Saginaw, Mich., by York-Shipley, Inc., is second merger in two months for the York, Pa., firm. Acquisition of Humble-Mundis Company by York-Shipley also was announced recently.

Promoted

Wilfred E. Walton, left, is new Director of Engineering at American Machine & Foundry Company's Rochester division. Formerly with GE, Walton graduated from Rennsalaer Polytechnic Institute, and is a registered professional engineer.

Walton

Healy

Edward J. Healy, right, is newly-elected vice president, construction, The Kuljian Corporation, Philadelphia, Pa., engineering firm. His professional career includes more than 25 years in engineering construction. Healy is a graduate electrochemical engineer from M.I.T., member of ASME, NSPE, and is also a registered engineer.

Second inner-cooled generator in TVA service

A 250,000-kw Westinghouse inner cooled generator, second to be installed, is now in service at TVA's Gallatin station. Unit completes order for two 24,000-v,. 3600-rpm inner-cooled generators. High power of the unit, which has a capability of 319,-445-kva at 45 psig, is made possible by inner-cooling construction, eliminating temperature rise in steel and in high voltage insulation. Increased mechanical

reliability of rotor results from inner cooling, with rotor smaller in diameter and 50% lighter than conventional units.

Large statistics department

In a continuous 2200-cu yd pour, concrete foundations for the fourth blast furnace at Kaiser Steel Corporation's Fontana, Calif., steel mill were completed in 7 hours, 7 minutes. Operation required 49 transit mix trucks, 13,200 sacks of cement; will raise Kaiser's ingot capacity to 3 million tons/year.

Womanpower can ease manpower shortage

America's growing engineering manpower shortage can be eased by womanpower, Emma C. Barth, Westinghouse engineer, believes. But prejudices are keeping girls out of engineering. "Why is it," she asks, "that out of more than 120,000 women who received degrees in 1956, only 62 were graduated in engineering?"

Miss Barth is one of five women engineers with Westinghouse. She was graduated from Pitt's engineering school after completing seven years of evening studies there. Her professional work is in the turbogenerator field.

Miss Barth, meet Mrs. Langford, of Burndy

Appointment of Ruby S. Langford to an engineering post with Burndy Corporation, Norwalk, Conn., brings to four the number

of women engineers working for the electrical manufacturing concern. Employing about 100 graduate engineers, Burndy's percentage of female engineers is four times the national average. Mrs. Langford is a technical service engineer for Burndy's utility-in-

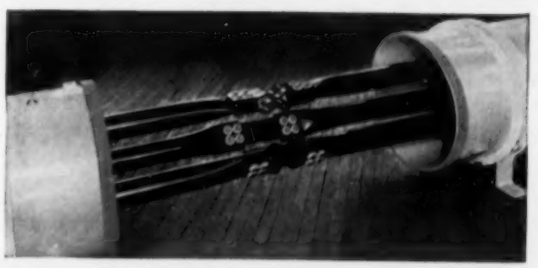
I-T-E

NONSEGREGATED PHASE BUS

. . . completely sealed, air and porcelain insulated

I-T-E adds another first to its achievements in the design and development of bus structures—4.16, 7.2 and 13.8 kv., 1200-3000 ampere nonsegregated phase bus that is completely sealed and air and porcelain insulated. No organic materials are used for insulation. Cork neoprene-gasketed split-half round covers provide a completely sealed bus that can be used indoors or outdoors; bare copper or aluminum conductors are mounted on purified porcelain which has high dielectric strength, is inherently contamination free. The entirely new design has other outstanding advantages, too. The circular design permits installation in much less space. Flexible or laminated connectors make unit sections easier to install.

I-T-E nonsegregated phase bus is ideal for generator leads to transformers, for connecting transformers to switchgear assemblies, for interconnecting switchgear assemblies, and for distribution of light and power in factories and office buildings. For complete information on this new I-T-E product, contact your local I-T-E sales representative. Or write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.



COMPLETELY SEALED, AIR AND PORCELAIN INSULATED DESIGN eliminates organic insulating materials, permits use indoors and outdoors. Circular construction permits installation in much less space, provides optimum performance—mechanically, thermally and electrically. Laminated connectors provide unusual flexibility, simplify installation. Also compensate for expansion and contraction in service.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

IN CANADA: EASTERN POWER DEVICES LTD.

I-T-E

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Consulting Engineers: Seelye, Stevenson, Value & Knecht. Heating Contractors: Almirall & Co., Inc. and Norman Heating Co., Inc.; Eugene J. Brandt & Co., Inc.

LARGE TRENCH AT IDLEWILD shows one expansion loop in foreground and another in background. Note large pipes for chilled water lines running outside of the walled trench containing the high temperature hot water system. The control tower is in the center of the photograph, and the new International Arrival Building is at the right of the tower. The bags of GILSULATE are slid down boards into the trench.

$90,000,000 Idlewild expansion program uses 1515 tons of GILSULATE to protect 7 miles of pipe

New York International Airport Has One of World's Largest High Temperature Hot Water Systems

By 1960 "Terminal City" will be a completed reality at New York International Airport. This gigantic undertaking comprises 655 acres and will be equipped to handle 140 aircraft at one time. Estimated cost of the project is $90,000,000.

Running from a central heating plant to each of the projected buildings in Terminal City is one of the world's largest non-military high temperature hot water systems ever designed. This system, operating at 380°F on the supply and 240°F on the return lines, includes 38,774 feet of pipe (7.34 miles!), virtually all of which is protected with 1515 tons of Type B GILSULATE. In this gigantic system, expansion loops alone total almost one mile!

Big job or small job, GILSULATE offers the same unique protection for underground hot pipes—and the same opportunity for on-the-job savings. GILSULATE is easy to install; it calls for no trained fitters or applicators, no special installing equipment. So whether *your* piping job is large or small, you'll find that GILSULATE fits right into your specification picture—at a lower cost per installed linear foot than any other underground hot pipe insulation.

For more complete information, see your local GILSULATE distributor, or write any of our offices listed below.

Artist's sketch of Terminal City showing proposed buildings and extent of high temperature hot water system.

FACTS ABOUT GILSULATE

1. **EASY TO USE**—just pour and tamp... pipe heat does the rest.
2. **FORMS 3 ZONES** of protection against heat loss and all hazards commonly encountered by buried hot pipes.
3. **NEEDS NO HOUSING OR MECHANICAL SHEATHS:** no mixing, special handling or equipment.
4. **ONLY NEEDS NORMAL PIPE SPACING:** for multiple pipe or cramped conditions.
5. **THREE TYPES AVAILABLE:**
   Type A for 220°-300°F. temp. range
   Type B for 300°-385°F. temp. range
   Type C for 385°-520°F. temp. range

AMERICAN GILSONITE COMPANY
SALT LAKE CITY 1, UTAH

Affiliate of Barber Oil Corp. & Standard Oil Co. of Cal. OFFICES AT: 134-S West Broadway, Salt Lake City, Utah. The Agents Building, 3537 Lee Road, Cleveland 20, O.

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GILSULATE®
The Triple-Zone Insulation System for Lifetime Protection of Underground Hot Pipes

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ip news

dustrial division. She is a Columbia University graduate, member of ASME, and the Society of Women Engineers.

Diamond develops rectangular diaphragm cell

Installation of a 30,000-amp rectangular diaphragm cell for electrolytic production of chlorine and caustic soda will be made by Diamond Alkali Company in the Geismar, La., plant of Wyandotte Chemicals Corporation. Representing development of 14 year's exploratory design and engineering by Diamond, new cell improves production efficiency and operating conditions in electrolytic chemical manufacture.

B&W to make nuclear fuel elements for Danes

Babcock & Wilcox Co. will make 45 nuclear fuel element assemblies for the Danish Atomic Energy Commission's tank-type research reactor. Assemblies will be fabricated from uranium enriched to 20% of U-235 isotope, maximum enrichment permitted for use in foreign research reactors under President Eisenhower's Atoms for Peace program. Delivery is set for September 1. B&W also plans to ship a 5000-kw pool-type reactor, fueled with same elements as the Danish type, to Germany. AEC has filed notice of proposed issuance of the license covering the export. Reactor will be delivered to the Society for the Utilization of Nuclear Energy in Shipbuilding and Navigation, Hamburg.

McGill names Bouvier as chief engineer

Ray A. Bouvier, Colebrook, Conn., has been appointed Chief Engineer, McGill Manufacturing Co., Electrical Division. Bouvier was formerly an industrial engineer with New Haven Clock Co., New Haven, Conn.

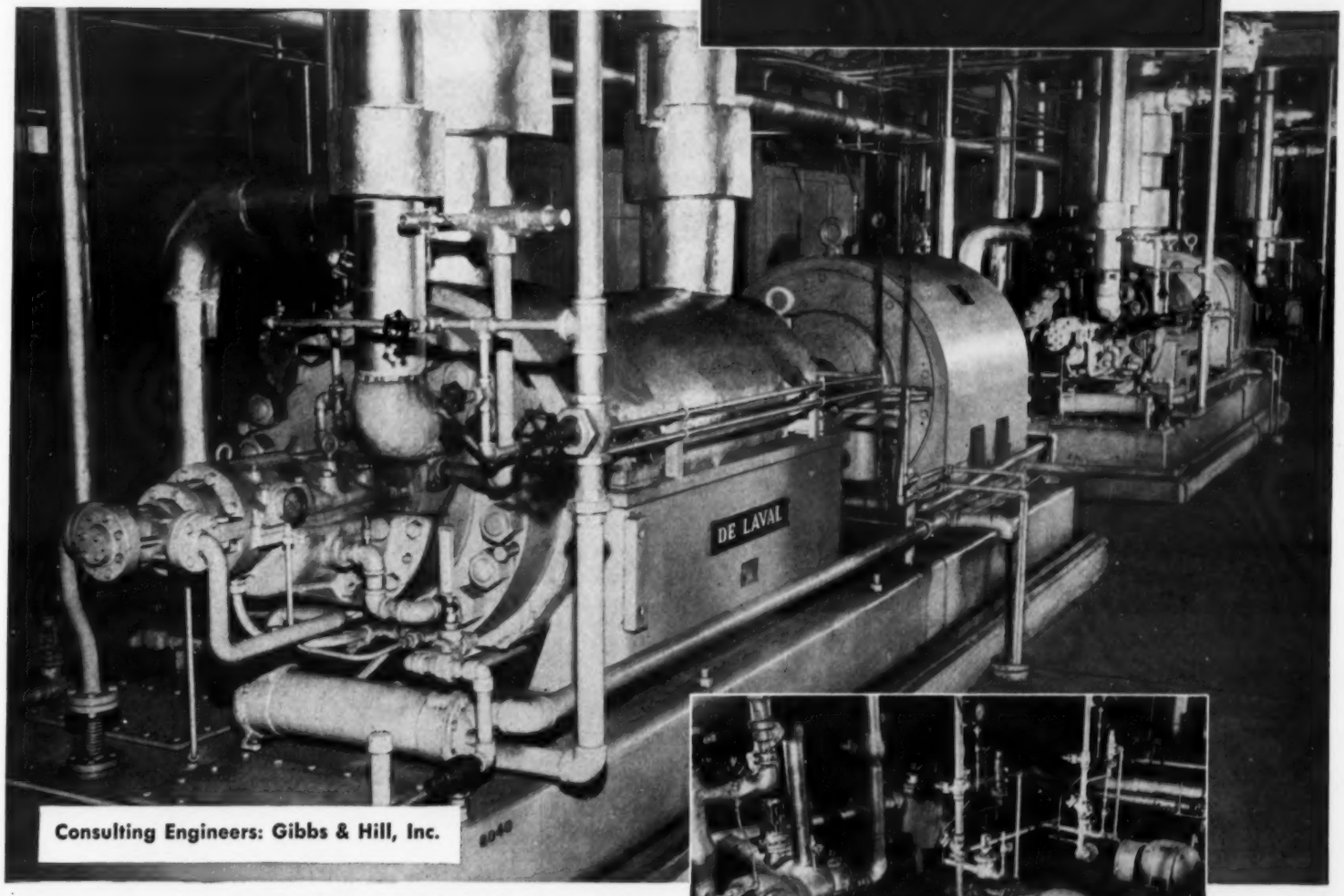
Electronic detector finds one part in two million

General Electric's Instrument department has newly improved electronic leak detector so sen-

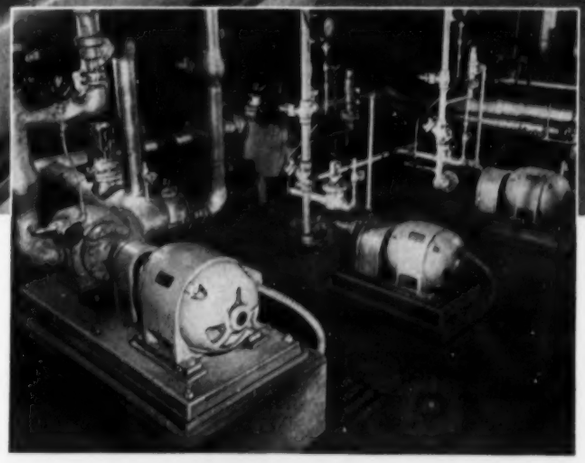
(more on page 12)

Atlantic City Electric ... another utility using

DE LAVAL
BARREL TYPE BOILER FEED PUMPS



Consulting Engineers: Gibbs & Hill, Inc.



De Laval IMO rotary positive displacement pumps handle heavy fuel oil. They are used for standby operation.

Atlantic City Electric Co. and Gibbs & Hill, Inc., Consulting Engineers, know that they can count on De Laval reliability. That's why they selected three De Laval high pressure barrel type boiler feed pumps for the Deepwater Station in Penns Grove, New Jersey. These 10-stage units deliver 675 gpm, operating at 1762 psi with temperature at 287 F. The pumps are driven by 900 hp motors.

De Laval barrel type boiler feed pumps operate at pressures up to 5500 psi. These units offer many important design advantages, such as double volute diaphragm, individual diaphragm bolting, only one inner high-pressure joint, and bare shaft construction. Their dependability is proven by year in, year out service in public utilities and industrial plants.

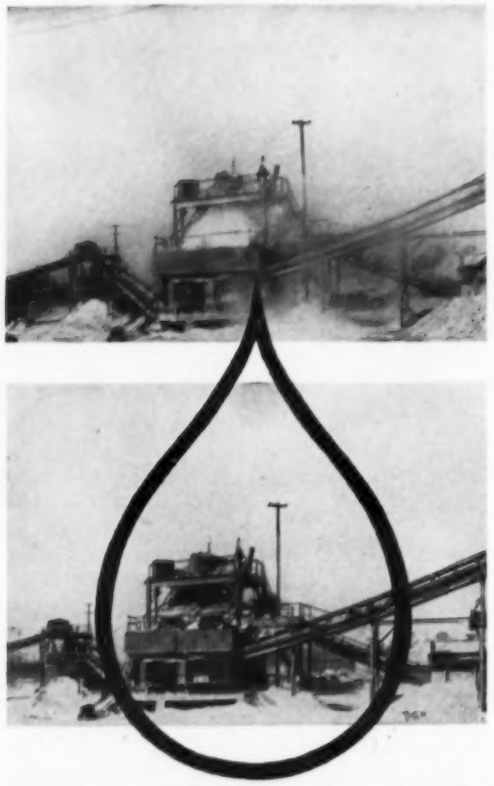
Send for De Laval Bulletin 1506, which contains helpful data.

DE LAVAL *Boiler Feed Pumps*

DE LAVAL STEAM TURBINE COMPANY
857 Nottingham Way, Trenton 2, New Jersey

DL-343

Circle 102 on READ-N-CIRCLE card for more data



without enclosures, fans or collection bags . . .

THE CHEM-JET SYSTEM STOPS DUST AT THE SOURCE

With Chem-Jet dust control, the dust problem never gets off the ground—literally. Chem-Jet suppresses dust *before* it becomes airborne. A thin veil of specially treated, surface-active moisture applied at the dust-producing area stops even sub-micron sized particles.

Indoors or out . . . wherever bulk materials processing creates dust, a job-engineered Chem-Jet System can control it—at a surprisingly low cost.

Bulletin CJ-1 explains how an inexpensive Chem-Jet System can be designed around existing plant facilities to give you dust-free operation. A copy is yours for the asking.

Johnson March

DUST CONTROL ENGINEERS

1724 Chestnut Street, Philadelphia 3, Pa.

Circle 142 on READ-N-CIRCLE card for more data

this month's comment . . . .

. . . Presenting the new "executive size" of Industry Power magazine

Have you noticed? . . . INDUSTRY POWER is now *different.* Lay this or last month's copy alongside an earlier issue of IP . . . compare them. Hold the new issue on your hands . . . slip it into your brief case. It "fits" . . . it invites easy reading . . . for busiest-of-all power services executives.

it named itself . . . "the executive size" . . .

for as one of our editors said when it was in the planning stages, "This really *is* a magazine for executives!"

thus an earlier original design improves . . .

Nineteen years ago Putman Publishing Company created an original design for business magazines, known as "King Size" . . . bringing theretofore unknown visibility and greater effectiveness in editorial presentation (yes, for advertising too).

Scores of other magazines adopted this format, and use it today.

Now, the "Executive Size" brings you new advantages . . . while retaining the best of the old.

Turn to page 14. Look at the unusually effective presentation of the editorial matter . . . the "cinemascopic" wide screen layout.

Leaf anywhere through the magazine . . . editorial material everywhere . . . front and back. No solid sections of advertising pages . . . newspaper-width editorial columns invite easy reading throughout.

We think you'll find the new "Executive Size" of INDUSTRY POWER easier to read, more interesting. But what do you think? Our first interest is the reaction of our readers . . . and we'll welcome any comments you'll care to make.

Russell L. Putman

Russell L. Putman, President
PUTMAN PUBLISHING COMPANY

P.S. All Putman magazines now appear in this new "Executive Size" . . . CHEMICAL PROCESSING, FOOD PROCESSING, FOOD BUSINESS, as well as INDUSTRY POWER.

whenever
water
enters
the picture . . .
BETZ
CONSULTANTS ON INDUSTRIAL WATER PROBLEMS
BETZ LABORATORIES INC., Philadelphia 24, Pa.

news

sitive it can detect one part of helium in two million parts of air. Ten times more sensitive than other versions, detector finds and locates leaks in vacuum or pressure systems in electronic industries, nuclear developments, for quality control and production checks.

Ohio State's Carson heads industrial engineer group

Dean Gordon B. Carson, Ohio State University College of Engineering head, is the newly inaugurated president of American Institute of Industrial Engineers. He succeeds Prof. Howard P. Emerson, head of industrial engineering at University of Tennessee.

New coal docks will aid Ohio Valley power plants

Coal loading dock facilities now under construction at Powhatan Point, Ohio, will increase barge loading capacity 150%, give better service to major electric power plants in the Ohio Valley. Existing 700-ft dock will be doubled in size by Dravo Corporation for Powhatan Mining Company, and a new 350-ft dock will be added.

Synthetic sapphires shaped to satisfy

New advances in synthetic sapphire growing techniques are producing large single crystals competitive in price with sintered aluminas and quartz, says Linde Division, Union Carbide Corporation. Rods, disks, tubes, domes, and balls of sapphire in varying sizes are now available for industrial needs.

Kidde will supply CO_2 system for power project

Automatic carbon dioxide fire extinguishing systems for 16 air-cooled, 60,000-kva generators in the U.S. portion of the St. Lawrence Power Dam will be supplied by Walter Kidde & Company, Belleville, N. J. Contract calls for 4 electrically operated systems, each with 53 seventy-five pound cylinders of carbon dioxide.

COLOR-PORT

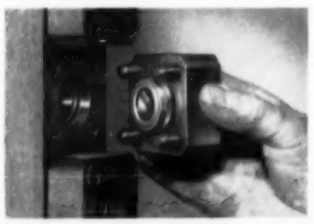
water level gage gives you . . . two-color readings . . . low maintenance . . . increased availability

You get a *triple advantage* with the Yarway COLOR-PORT boiler water level gage for pressures to 3000 psi.

Two-color readings are brilliant and clear. Water shows green; steam shows red. A full gage is all green and an empty gage all red.

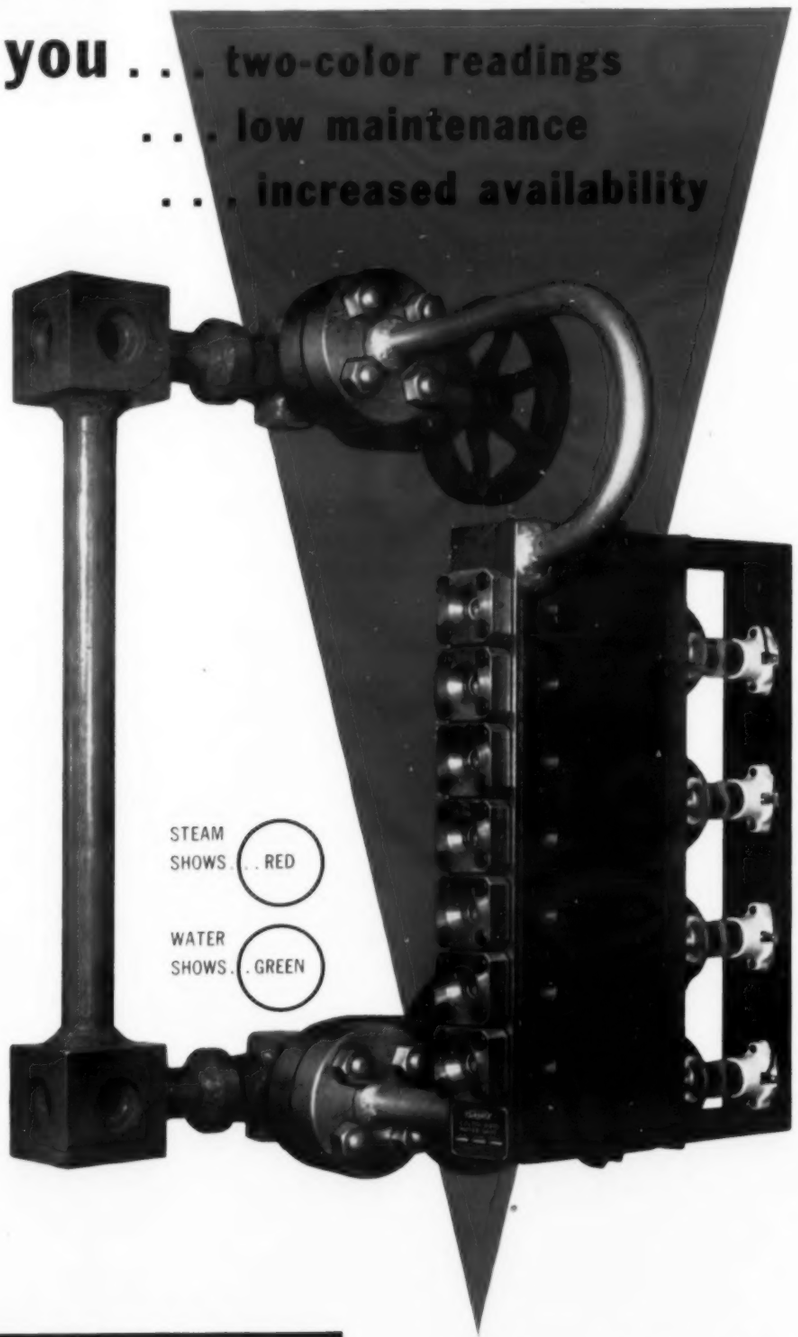
Low maintenance with individual cover-glass assemblies, each held solidly in place by four socket head cap screws. "Floating assembly" design applies safe, predetermined loads on glass ports, reducing thermal shocks, permitting faster warm-up.

Increased availability means longer service life. Cover glass assemblies can be *serviced in place*, easily and quickly.



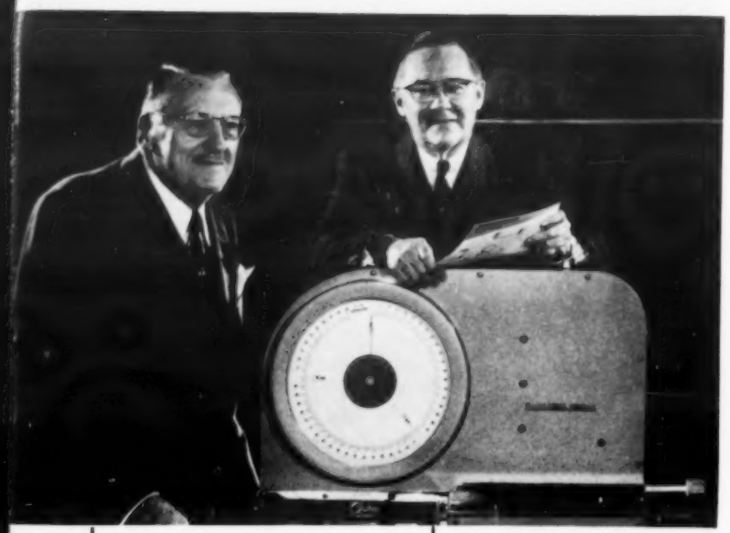
Yarway Bulletin WG-1814 describes the Color-Port Gage. Write for it.

YARNALL-WARING COMPANY
100 Mermaid Avenue
Philadelphia 18, Pa.
Branch Offices in Principal Cities



YARWAY COLOR-PORT . . . *a good way to specify high pressure water gages*

Circle 134 on READ-N-CIRCLE card for more data



Industry Power

Are we running out of water?

ROBERT H. MORSE, JR., President
Fairbanks, Morse & Co.

About Robert H. Morse, Jr.

Robert H. Morse, Jr. was born in Chicago on March 10, 1899. When, at 16, he announced that he was going to work instead of going to college, his father (above left) gave him $10, shook his hand, and wished him luck.

Young Morse went to Fort Wayne, Indiana, and found a job cleaning steel pulleys atop an enameling oven at the Dudlo Manufacturing Co. In a few weeks, he switched to the General Electric Co. as a meter inspector at 24 cents an hour.

A year later, he stood in line at the Fairbanks-Morse plant in Beloit, Wis., and got a job without telling his family about it. He was 17 years old.

In 1917, he enlisted in the army — again without telling his parents. After World War I, he returned to the Indianapolis plant as an office employee.

He worked as a branch house manager and a division manager to get the same kind of training and test of ability demanded of his father by his grandfather.

After taking time out in 1929 for a course at Harvard Business School, he became assistant sales manager, vice president in charge of sales and vice president in charge of operations. In 1950 he was elected president.

Mr. Morse is also a director of the United States Gypsum Company, the Continental Illinois National Bank and Trust Company of Chicago, and American Motorists Insurance Company, a trustee of Beloit College, a trustee of the University of Chicago Cancer Research Foundation and former president of the Diesel Manufacturers Association of the United States. He has been in the headlines recently in a proxy fight with Penn-Texas' Leopold Silberstein over control of the 100-year old Fairbanks, Morse & Co., in which Mr. Morse was successful.

ONE OF OUR NATION'S most vital, yet most often overlooked problems will make an impact on us this summer. It probably will come along during a sustained heat wave when our lawns are turning brown from thirst. We probably shall curse the municipal water department for curtailing the use of water. In some locales, this embargo has come to be accepted as one of the surest signs that summer has arrived. It also is a sign of something more critical; that we are not keeping pace with our growing water needs.

America needs 200 billion gallons of water a day to keep going. This amounts to 1100 gallons for every man, woman, and child. Of course, no one person consumes that much water directly. It is necessary to grow his food, run his home, and sustain the economy which supports him.

To cite some figures: Some 20 years ago, less than half of the single-family dwellings in the United States had running water. Today, the daily household use of water per American is estimated at more than 50 gallons.

All told, half of the 200 billion gallons of water pumped each day go to irrigation of farm lands. By far the next largest portion — 81 billion gallons — goes to industry.

The steel industry alone consumes four trillion gallons of water a year, using 18,000 gallons to make a ton of ingot iron and another 65,000 gallons to convert that ton of iron into steel. In the petroleum industry, where it takes 7010 gallons to make one 55-gallon barrel of gasoline, water consumption runs to one and one-half trillion gallons a year. It requires 160 gallons of water to make a pound of aluminum or a pound of synthetic rubber. We all know that it takes 6.9 gpm to feed a 100-hp boiler on 100% makeup. Water for hydroelectric generation amounts to 40% of industry's 81-billion gallons per day, and by 1975 it is estimated that hydrogeneration will be using an extra 18%.

Clearly, these are staggering requirements on our water systems. Around the great lakes the problem is not too acute as yet, but the remainder of the country is in dire straits. Large cities are becoming desperate for water.

All these figures deal with America today. Twenty years from now, when the population is expected to have grown 34% larger, it is estimated that water demands will have risen 50%. If all we had to do was hold our own and continue to supply ourselves with 200 billion gallons of water daily, the problem still would be a serious one.

There are two reasons for this: supply and equipment.

In many sections of our country, water is being consumed faster than nature supplies it to our streams, lakes, and underground sources. Some scientists are of the opinion that the polar ice cap is receding; that the melting ice is raising the level of our oceans, and that the resulting changes in thermal currents are affecting the precipitation pattern. Others believe that as we clear the land, we destroy our natural reservoirs. Rains run off quickly to the oceans. There is inadequate absorbent cover to hold precipitation, let it sink slowly into the soil, and accumulate underground. While soil conservationists are attacking this problem with vigor, it is certain that, until corrective forces are found, we will be forced to lift our water from greater depths and distribute it over greater distances. For example, there is one midwestern city of 100,000 where you now must drill 43 feet deeper for water than 10 years ago. During these 10 years, 1800 new wells were drilled in the 80-square-mile area of the city.

All this water to meet the daily needs at home, on farms, and in industry is brought to its destination by pumps. Much of it is

(continues on page 19)

On July 31, Idlewild International Airport's Arrival Building will be opened. Here are the details of how the Port of New York Authority engineered high-temperature water system for . . . .

Space heating at Idlewild

CHARLES BRODER
Mechanical Engineer
Port of New York Authority

Charles Broder is the man responsible for mechanical design on all projects of the Port of New York Authority's engineering department. He was graduated from M.I.T. with a B.S. in M.E. in 1931, and a Master's degree in 1932. Broder organized and taught courses in heating, ventilating, refrigeration, and air conditioning at Walter Hervey Junior College. He is Lt. Colonel, Ordnance Corps, USAR. He served in World War II for three years, Pacific Theater, with later active duty in the Korean War. Mr. Broder is a Licensed Professional Engineer in the State of New York, member of the American Society of Refrigeration Engineers, and NSPE.

Space heating with high-temperature water is rapidly becoming more popular. Less than two years ago, we reported on a huge installation at McGuire Air Force Base. And here's another first. In this Idlewild installation, high-temperature water is used not only for heating but also for air cooling (See separate cooling story on page 22).

A $6 MILLION central heating and refrigeration plant will supply high-temperature water and chilled water to all buildings in the central oval area of Idlewild International Airport. This central area will contain the International Arrival building, three stories high and 11 city blocks long. The Arrival building will house all Federal inspection services, food services, banking, and many other facilities. Wing buildings will provide offices, ticket counters, and operational space for foreign-flag airlines.

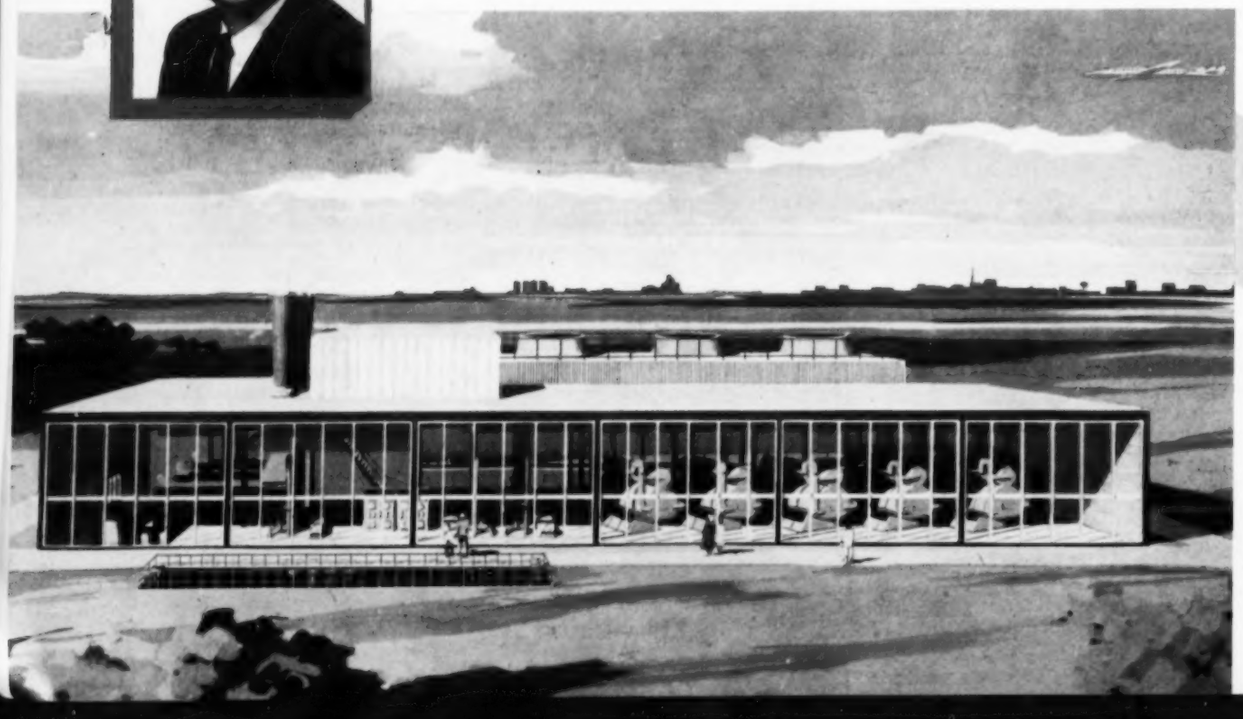
A central heating plant, located within the oval perimeter, eliminates the necessity of constructing, operating, and maintaining facility plants in each building. Cleanliness of the overall area, saving valuable space in each terminal for airline operations, efficiency in overall operation, and minimum maintenance through use of a central plant were some of the reasons for its construction.

Originally, it was planned to have the heating plant and cooling equipment in a utility room in each individual building, but this would have limited useable operational space in each building. A revised plan considered the possibility of locating the boilers in a separate plant and furnishing high-temperature water to the terminals, leaving the refrigeration machinery in each building. This was unsatisfactory, as it still required valuable space in the terminals. The final plan put all the required equipment in one central plant. High-temperature water and chilled water are supplied through underground piping to all user buildings.

High-pressure hot water could be generated readily enough by using market-available generators and auxiliaries, but the proposed refrigeration installation posed problems. The ideal solution proved to be high-temperature water heating and absorption refrigeration equipment.

The plant building is "L" shaped with its 180-foot leg facing the central area. The exterior wall facing the central area is 22 feet high, and has over 80% glass to allow spectators maximum view of the interior and plant operation.

Four La Mont-type International Boiler Works Co. high-temperature water generators are housed in the shorter wing. Each is rated at 40 million Btu/hr output. High-temperature water at 400 F and 250 psig is pumped from the boilers to an expansion tank. International-La Mont water-tube boilers are of the forced recirculation type with radiant water-wall furnaces and counterflow economizers in the last pass. Todd burners fire No. 6 oil or natural gas. Air register of each unit controls and directs air admitted to the furnace for fuel combustion. Oil atomizers are mechanical, with oil pressure varying between 25 and 125 psig. They are steam assisted for final atomization with steam pressure ranging between 20 and 60 psig. Steam pressure is always at least 5 psi lower than oil pressure during operation. Pressure changes occur as a result of changes in load demands, and boiler control mechanisms vary the fuel supply to meet these demands. A perforated annular ring on the burner frame introduces natural gas into the furnace. Switchover controls on the master control panel that are specifically designed for high-



L-shaped central plant is designed as a showplace with glass walls, terrazzo floor, and pastel equipment.

velocity forced water circulation allow the plant to be operated on either fuel.

boiler auxiliaries located in wing

This shorter wing also houses six boiler circulating pumps, five system circulating pumps, fuel oil heating and pumping sets, steam generator, chemical treatment tanks and equipment, makeup water pumps, deaerator, boiler instrument panels, and auxiliaries.

On the mezzanine, between the two wings of the building, are the high-temperature water expansion tank and the main electric switchgear and transformers. The expansion tank is horizontal, 40-ft long and 84-in. dia, with elliptical heads at each end. It has six 12-inch connections for boiler circulation and system circulation between plant and user buildings. Discharge pipes from both systems extend into mixing headers inside the tank. These are constructed so that discharge water from both systems must mix before entering the tank. Tank has four 4-inch by 6-inch safety valves, a water gage, air vent and blowdown valves, nine local indicating thermometers, a remote indicating gage, local pressure gage, chemical feed connection, automatic overflow and makeup water controllers, and temperature gage.

boiler makeup water is automatically controlled

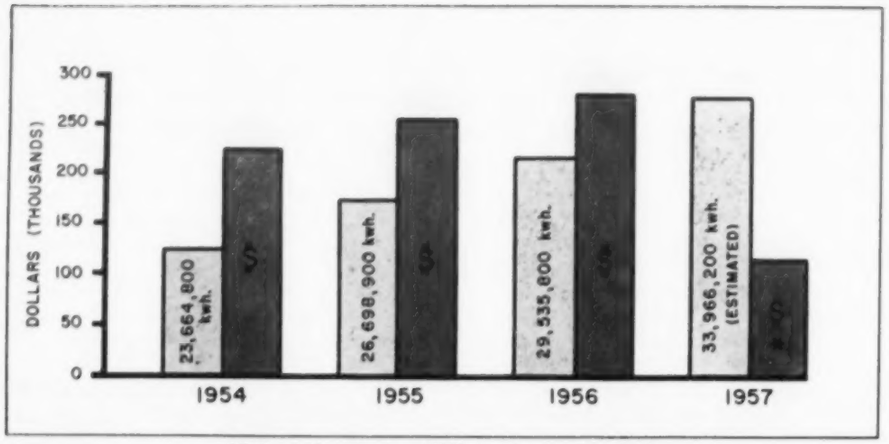
Makeup water is automatically fed to the tank by 20-gpm capacity reciprocating pumps, controlled by Magnetrols. Overflow is pneumatically controlled by a float-actuated pilot valve and diaphragm-operated overflow valve. Remote indicating water level gage has two mercury switches that actuate high- and low-water alarm annunciators and the boiler interlock relay. Annunciators operate audible alarms and lights. Boiler interlock relay actuates additional relays that stop fuel flow to boilers and boiler circulation pumps.

Four of the six Worthington boiler circulation pumps are used, one for each boiler. The other two are spares and serve two boilers each, when necessary. Each pump has 570-gpm capacity at 60-foot head. Pump bearings are water cooled, oil lubricated, ball-bearing type. City water is used as bearing cooling medium and discharges to the cooling towers as makeup water to replace evaporative losses. Each pump is manually controlled through combination starters for start and stop, with a lock out button at each pump for local control. Although there is no automatic start, pumps can be shut down through interlocks in emergency. The main function of these boiler circulating pumps is to force return water, received from the external circulation systems, through the boilers into the expansion tank. Some water flows directly from the expansion tank through the boiler pumps when total system circulation is less than total flow through the boilers. As each boiler is put on the line, its circulating pump is also started. Each boiler circulating pump is started prior to placing any boiler in service. Both water circulation rate through each boiler and boiler outlet temperature are constant. Variation in heating load is controlled by fuel firing rate. Boilers and pumps are manually put on the line as required by the load.

high-capacity pumps meet system demand

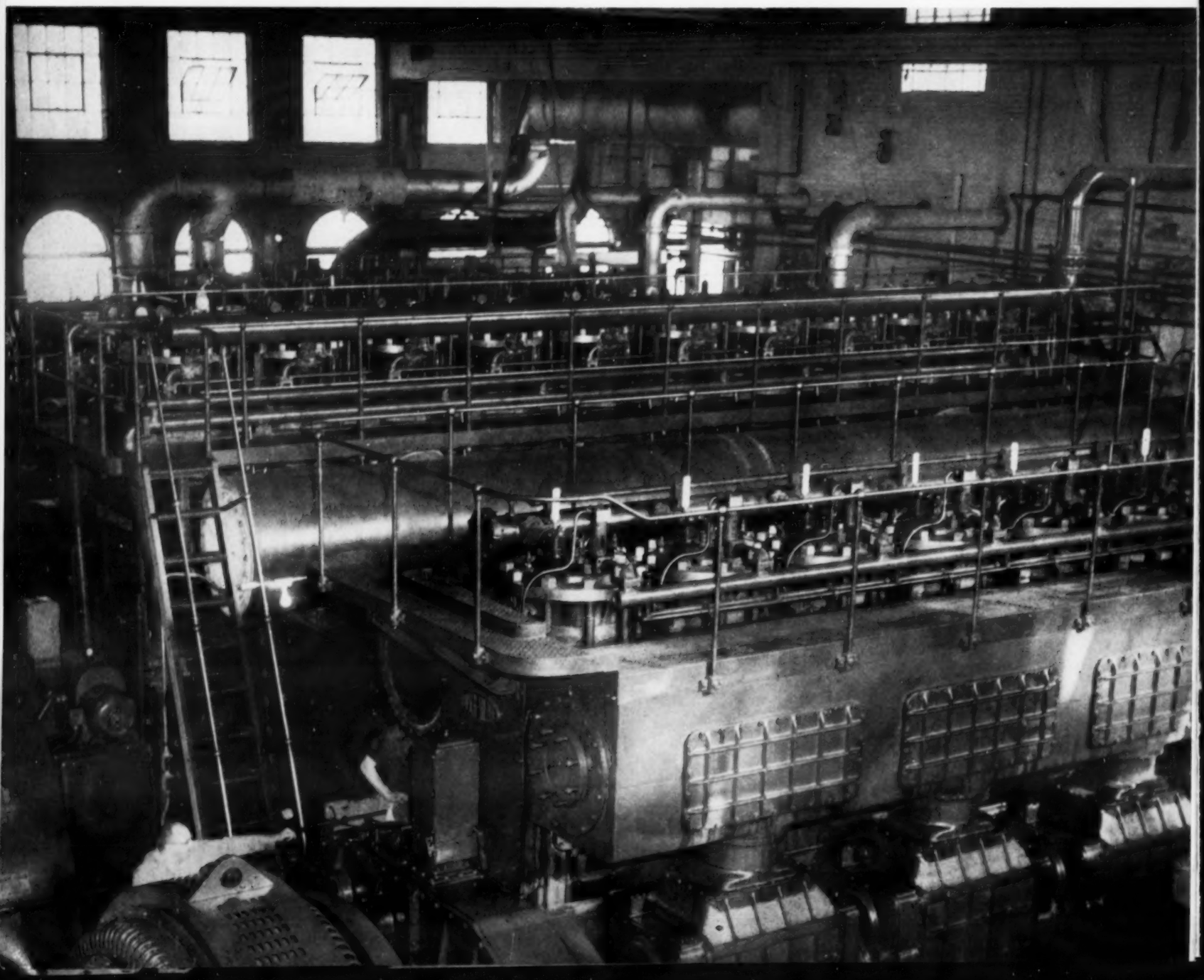
The high-temperature hot-water circulation system distributes water from the boilers to all user buildings and plant equipment by five Worthington centrifugal system circulation pumps. Each has 700-

(continues on page 38)



*Estimated cost using 100% crankcase oil as fuel.

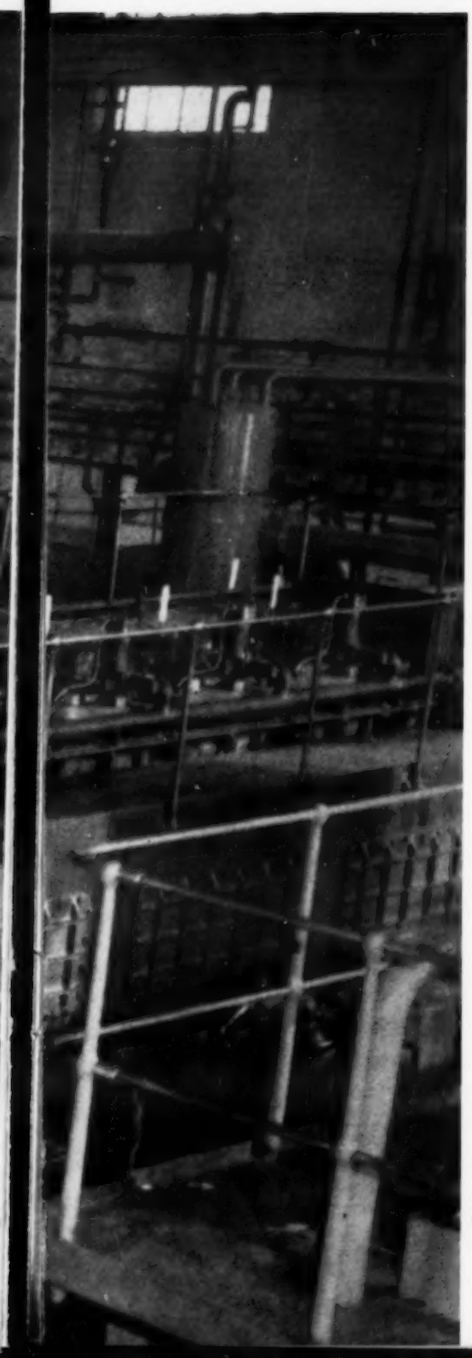
Increasing cost of No. 2 diesel fuel is an important criterion that is shaping management decisions on new power plant construction. It also seriously affects operating economies in existing diesel power plants. Use of reclaimed crankcase drain oil, while only a partial solution, is a significant step toward reducing operating costs, as well as an example of good energy conservation practice.



Hudson, Massachusetts, Light and Power department
turns waste product into profit as they . . . .

Operate diesel engines on crankcase drain oil

D. M. LANDIS
Vice President
De Laval Pacific Company



Eight diesel engines, rated at 16,605 horsepower, satisfy the power demands for Hudson, Mass.

USED CRANKCASE OIL, a low-cost fuel, is being successfully used in diesel-electric power plants by the Town of Hudson, Massachusetts, Light and Power department. Eight diesel engines, (the latest a 5100-hp Nordberg, driving a 3600-kw generator) are operating on either 100% crankcase oil, or a mixture of crankcase oil and No. 2 fuel oil.

With increasing cost of No. 2 diesel fuel, Thomas A. Walsh, Manager, and Willard Allen, Power Plant Superintendent, conceived the idea of using crankcase oil in place of regular diesel fuel. Fuel is the largest single operating expense and its cost is directly reflected in power generating cost. A local concern was collecting used crankcase oil and selling it as heating fuel in the winter. It costs even less than No. 6 fuel oils. Table I shows delivered prices of various fuels in the area.

TABLE I
FUEL PRICES

Fuel	Del. Price Per Gal.
#2 Fuel Oil	12.5¢
#6 Fuel Oil	8.0¢
Used Crankcase Oil	5.0¢

Used crankcase oil is much easier to handle than the heavy No. 6 oil as it has much lower viscosity. If No. 6 fuel oil were substituted in place of No. 2, a gross saving of 4.5¢/gal would be possible. By using crankcase oil, however, a gross saving of 7.5¢/gal is enjoyed.

William A. Leary, Hudson's Consulting Engineer, made initial investigation on possible use of crankcase oil. He obtained samples of used crankcase oil for examination and laboratory analysis. Examination showed the possibility of using this oil as diesel engine fuel, provided that certain impurities were removed. Suspended solids and water were removed with a small centrifugal oil purifier available at the plant. Oil passed from the purifier into a string-type filter. Next, Hudson's engines were tested under Leary's direction, using a blend of crankcase oil and No. 2 fuel. First tests were made with a mixture containing as much as 80% No. 2 fuel. As tests progressed, and the engine functioned satisfactorily, the diesel fuel in the mixture was reduced until finally 100% crankcase oil was being burned.

new purifier handles 1500 gph

As larger quantities of purified crankcase oil were required, the small purifier became inadequate. A larger purifier, with approximately 4-1/2 times the capacity of the older machine, was installed. This new purifier had a rated capacity to handle 1500 gph of No. 2 diesel oil. To insure complete removal of impurities, however, it was operated with crankcase oil at only 200 gph capacity. Excellent purification results were obtained.

For test work, No. 5 engine was used, a Type 8-T-36 Alco Sulzer rated 1480 bhp at 277 rpm. Mr. Allen commented: "If we can burn crankcase oil successfully in this particular engine, we feel that we can burn it in any of our other engines." This 2-cycle, single-action engine is equipped with mechanical injection, Sulzer Pumps, and Bosch Nozzles. When first installed, this engine was troubled, to a certain extent, by a deposit forming in the scavenging ports. When burning No. 2 fuel, the deposit was a tar-like solid. It was surprising to find that with crankcase-oil fuel, the deposit was softer, drier, and more easily removed. This was one advantage that had not been anticipated.

To convert to crankcase oil use, the only engine modification was to eliminate dead ends in the fuel piping. Heating equipment was also provided so that fuel could be heated to 225 F, if necessary. The converted engine is also suitable for burning No. 6 residual fuel, should crankcase-oil supply run out.

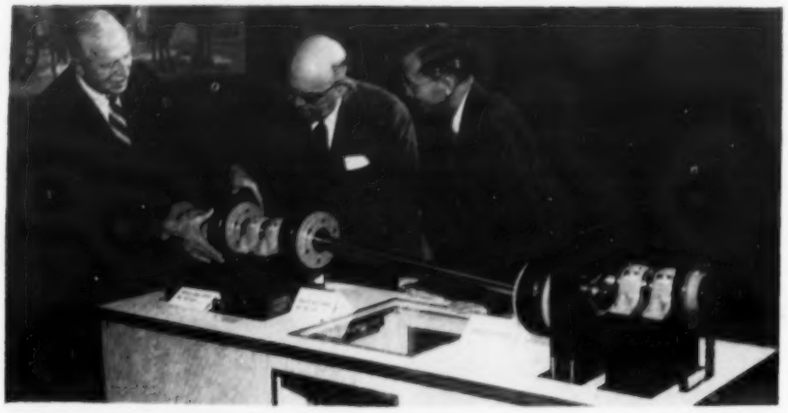
Early tests were conducted with crankcase oil that had been stored undisturbed for several months. As a result, a considerable amount of the sludge had settled out. This settled oil was purified by the centrifuge at a high rate. Considerable quantities could be centrifuged without stopping to remove accumulated solids from the purifier bowl. When the settled oil supply had been consumed, a new supply was delivered. It had almost ten times the suspended solids content of the settled oil. Although the centrifuge could purify this oil as completely as before, the bowl required frequent cleaning. More time was being spent in cleaning than in operating. This was unsatisfactory. It was difficult to purify sufficient fuel to keep the engine operating.

De Laval runs 1000 gal test

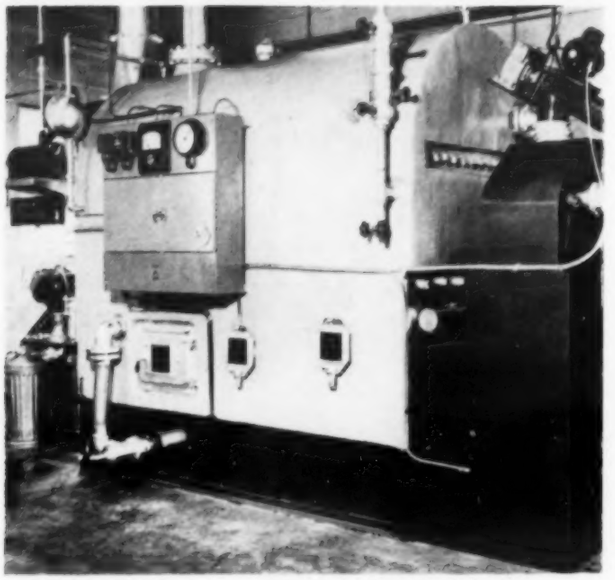
Results obtained in other plants with the De Laval continuous nozzle-type centrifuge handling heavy residual fuels were investigated. This same equipment probably could be applied to dirty crankcase oil. One thousand gallons of dirty crankcase oil were delivered to the manufacturer's plant at Poughkeepsie, New York. Oil was heated to approximately 200 F and run through a full-scale heavy-fuel installation.

(continues on page 48)

News in Photos



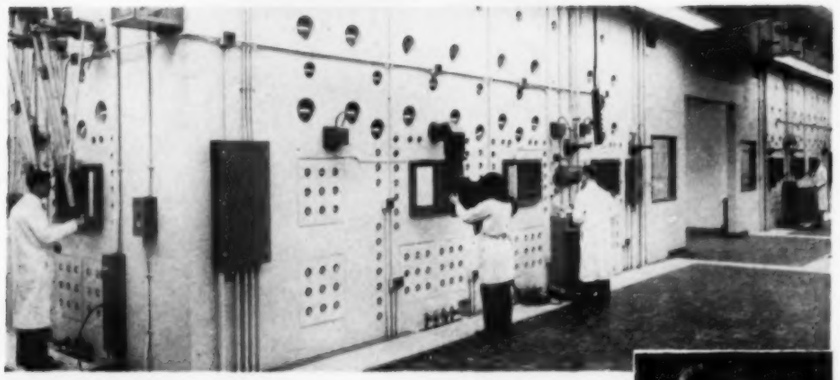
NEW FLEXIBLE COUPLING, Para-Flex, introduced by Dodge Manufacturing Corp., is discussed by, left to right, Harry A. Torson, vice president, sales; J. E. Otis, Jr., President; and Jackson Chung, Chief Development Engineer. New coupling was developed in West Germany four years ago, is being used there extensively in heavy industry. For details, see page 26.



FIRST of four units of the coal-fired automatic steam generator developed by Bituminous Coal Research, Inc., has just been built by International Boiler Works Company, E. Stroudsburg, Pa. Equipment is designed for unit installation in commercial and small industrial plants. Suitable for either steam or hot-water heating, BCR generator utilizes water-cooled pulsating grate, water tube boiler.

NEWLY elected president of AIEE is Walter J. Barrett, New Jersey Bell Telephone Company executive. Barrett will take over as head of the engineering society August 1. His election came at the group's annual meeting in Montreal Canada, June 24.

MAJOR CONSTRUCTION work is now starting on Commonwealth Edison Company's 180,000-kw Dresden Nuclear Power Station, largest all-nuclear power station in the U.S. Excavation shown will contain base of 190-ft steel sphere for the dual-cycle boiling water reactor plant, scheduled for completion in 1960. Commonwealth Edison and Nuclear Power Group are co-sponsoring Dresden project.



"HOT" CELLS in radioactive materials laboratory at GE's new Vallecitos Atomic Laboratory with technician under hood making microscopic examination of irradiated metals. Four test cells are equipped with shielding windows, master-slave manipulators, and access ports. Inset, Francis K. McCune, vice president and general manager of GE's Atomic Products division, which operates the newly dedicated atomic research facility.

Water shortage

. . . starts on page 13

pumped several times. Pumps of this nation transport more daily tonnage than all the other transportation systems combined. Pumps, however, are designed to do one job efficiently and that's all. It is not practicable to "adjust" them for bigger capacities. For the water consumer, the picture is an unhappy one, but for the pump manufacturer, it is a challenging opportunity.

As the search for water sinks deeper into the ground, greater pumping capacity becomes necessary. The need for more water brings with it the need for more pumps. The city of Chicago is buying eight pumps, six with 90,000 gpm capacity each. Our company also has built and installed some 144-in. pumps with 750,000 gpm capacity at low head. Being mechanical, a pump grows old and wears out. It has been estimated that pump manufacturers will be called on to duplicate the whole of our present pumping facilities within the next 20 years.

Municipalities and their officials are well aware of the task ahead. Our cities are tightening regulations, and most states are keeping a tighter control on well digging.

But conservation programs are having very little effect on the situation. The problem will not be solved by municipalities, or conservationists, or pump manufacturers alone. Industry, civic organizations and individual citizens must be enlisted, too. The water problem is everybody's problem. Water is the most basic need on earth.

While science has devised substitutes for food, no one has found a substitute for water. It is a vital ingredient to an expanding population and expanding economy, as well as to just plain everyday living. Our need for water is not subject to the whims of prosperity or politics. It is a need inevitably present. It is a need that will inevitably grow. Even the chap who prefers a glass of cold beer to a drink of water on a hot summer day, might do well to ponder the fact that it takes 470 gallons of water to make just one barrel of beer. ♦ ♦

Tests Prove

Low Sound Level High Efficiency

Constant tests prove that ALL Sorgel dry-type transformers have low sound levels and high efficiency. These have been outstanding features in Sorgel transformers for many years; in fact, we are the pioneers in establishing low sound levels which we guarantee to be well below the established standards in ALL ratings up to 3000 Kva.

Completely modern testing facilities enable us to prove the sound level, efficiency, temperature rise, and performance of Sorgel transformers before installation.

Because of their low sound level, ALL Sorgel dry-type transformers are adaptable for any indoor installations — especially where low sound level is an important factor.

The liberal design of Sorgel dry-type transformers results in high efficiency at all loads, and they will carry an overload during an emergency at a safe operating temperature.

Sorgel sound-rated transformers are time-tested, and are specified by discriminating engineers and users everywhere.

Available in all standard and intermediate ratings — ¼ Kva to 3000 Kva, up to 15,000 volts.

Sorgel transformers are also incorporated in substations. Available with any type or make of switchgear, or from any substation manufacturer.

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 841 West National Ave., Milwaukee 4, Wisconsin

40 years' experience in the development, manufacturing and application of transformers

Circle 124 on READ-N-CIRCLE card for more data

Municipal garbage and refuse disposal using outmoded dumps with attendant odor and health hazards did not fit into the progressive plans of the Oakland County Authority. A municipal incinerator that would handle all refuse, including tin cans and glass, was the obvious answer. The incinerator plant, designed around modern materials and construction methods, has a proven record for low-cost, efficient operation.

Skyscraper-type construction prevents wall cracking, minimizes heat loss, reduces repairs, and results in . . . .

No *smoke* or *odor* at Oakland's

MUNICIPAL INCINERATION proved to be the answer to garbage and refuse disposal problems for Oakland County, Michigan. Incinerator, controlled by the Southeastern Oakland County Authority, incorporates up-to-date safeguards to prevent smoke and odor pollution.

Incinerator burns an average 300 tons of wet refuse every 24 hours. Maximum capacity is 450 tons, large enough for the incinerator to serve the needs of 14 cities and townships. The installation has capacity for additional expansion should population shift from Detroit to suburban areas. All types of material are charged, including garbage, paper, debris, tin cans, and glass. Bulk reduction is 70%. Residue material is used as land fill. Smoke or odor have presented no problem. The installation is so efficient that in spite of heavy spring rains in 1956, there were only two days when burning fell behind schedule.

Oakland County's incinerator is housed in an attractive two-story building. All refuse is delivered by trucks and dumped into a pit on the first floor inside the building. Refuse is fed by crane into the three furnace hoppers and the material falls into specially-designed, Morse-Boulger round furnaces. Each of the three furnaces has a primary combustion chamber, an interconnection duct and a secondary combustion chamber. No auxiliary fuel is used. Temperatures in this area range from 1200 to 1600 F under normal operating conditions. At certain times, however, temperatures reach 1800 to 2000.

Solid masonry primary combustion chamber is required because it receives constant abuse from dumping refuse. Also, this particular section operates at somewhat cooler temperatures because moisture is released from refuse in the primary burning stage.

Occasional repairs will be necessary in the primary combustion chamber because of the heavy abuse it suffers. The rest of the furnace — featuring suspended construction — will last indefinitely with only minor repairs needed. Suspended walls and arches were selected over solid masonry walls for this installation because of their inherent ability to stand up under high temperatures with minimum repairs.

The idea of suspended enclosures is taken from skyscraper construction — erecting a structural steel framework from which supporting castings are hung. These horizontal brackets hold the refractory tile. Tile backs are either air cooled or insulated.

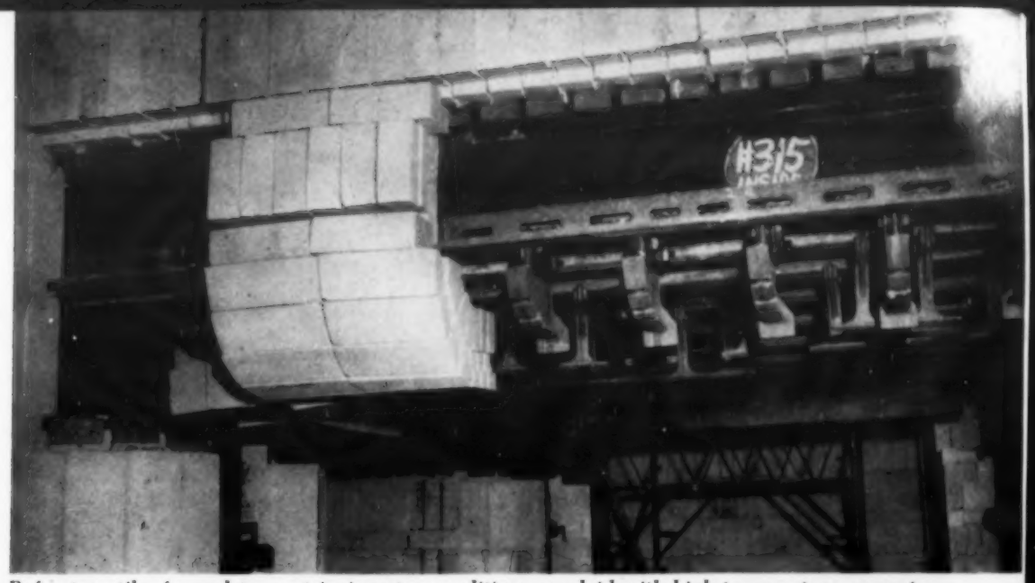
individual suspension limits compression load

Because these refractories are individually suspended, no one tile bears more than its own weight. The entire bottom course in the Oakland County incinerator, for example, could be removed without affecting the stability of the wall. Thus, suspended walls eliminate any possibility of cumulative loading. This is the complete reverse of the situation with a gravity wall. This principle simplifies tile repairs because only damaged areas need be replaced at any time.

On the other hand, a solid masonry wall that has been eroded by heat would require extensive repairs — usually a complete new wall — when the furnace is down for overhaul. In general, the lowest part of a furnace is subjected to the highest temperatures. If this section is under a compressive load, firebrick fusion temperatures are lower and trouble is likely.

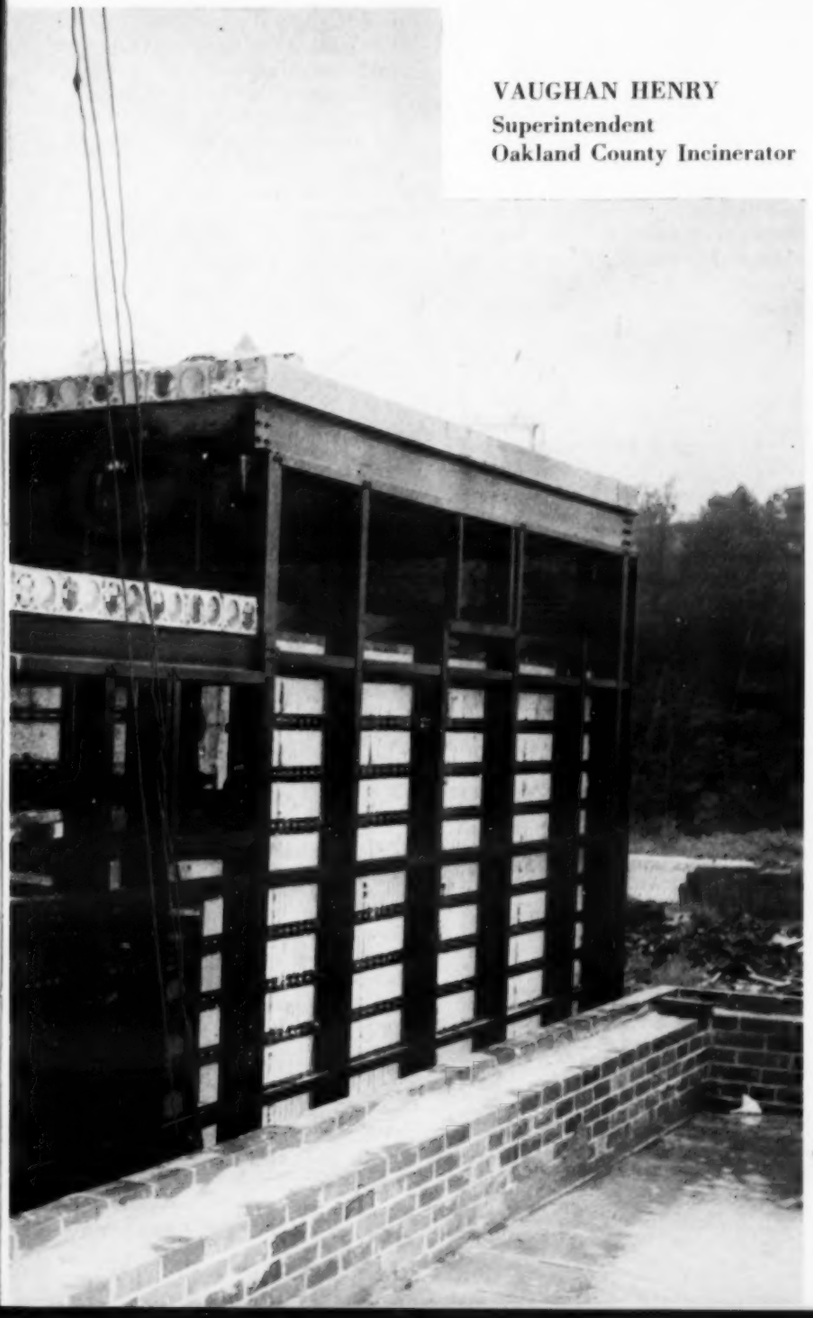
Suspended-wall tile is made from special grades of fireclay. Tiles can be removed from the installation and re-used. This feature is not inherent in solid brick walls, as they are most frequently laid up in high-temperature cement. This cement, when set, is stronger than the bond of the individual brick. When the wall is torn down, the

problems incinerators



Refractory tile, formed to meet incinerator conditions, are laid with high-temperature cement.

VAUGHAN HENRY
Superintendent
Oakland County Incinerator



Structural steel framework provides rigidity and load-carrying capacity for incinerator refractory courses.

bricks cannot be saved for reuse.

Along with cumulative loading, there is an additional hazard of cumulative expansion. Even firebrick will expand when heated. Expansion increases with temperature until about 2200 F. At this point, rate of expansion is about 1 inch in 12 feet. If provision is not made for both vertical and horizontal expansion, cracks in the furnace walls will inevitably result.

Solid masonry walls depend upon a jointing material, generally high-temperature cement, for stability. Some provision can be made for horizontal expansion, but no provision can be made for vertical expansion. Vertical expansion cannot be restrained without either bowing the wall or deforming the refractory. To aggravate the expansion problem, solid masonry walls expand at a greater rate on the hot side than on the cold side. This unequal expansion tends to break the brickwork bond, often resulting in vertical cleavage planes between inner and outer surfaces.

Suspended construction permits Oakland County engineers to have a furnace wall allowing for expansion in any direction. Vertical joints between each row of tile are buttered with a special plastic clay. This clay serves two purposes: it provides tight construction, and has a drying shrinkage that approximates thermal tile expansion.

Horizontal joints are designed with a scant ¼-inch clearance and are always buttered. Plastic clay is used throughout, and vertical expansion of the tile unit is partly compensated by clay shrinkage. Steel framework expands slightly when the furnace is operating. This again compensates for additional tile expansion. Expansion joints, provided at the ends of each wall, are further safeguards. These joints are offset in such a manner that jointing material is not subjected to combustion gases.

Another important advantage of suspended construction to Oakland County is the fact that there are no height or width limitations to the wall. Refractory thicknesses are governed by the temperatures involved. Even for most severe firing conditions, refractories need never be more than nine inches thick and can be reduced to as little as three inches in cooler portions of the installation. Contrasted to this, solid masonry walls must be proportioned in thickness to the wall height. In most cases, it is necessary to carry full wall thickness to full wall height.

All furnaces lose a certain amount of heat. Heat loss is greatest where walls are exposed to the highest temperatures. When a suspended wall is exposed to radiant heat, it is generally air cooled.

(continues on page 47)

Continuing from the article on page 14,
here are details of how
high-temperature water is used for . . . .

Cooling at Idlewild

CHARLES BRODER
Mechanical Engineer
Port of New York Authority

A CENTRAL HEATING and refrigeration plant for Idlewild Airport's terminal buildings presented several problems. Motor-driven centrifugal equipment would have imposed heavy electric loads on transmission lines. This would require new utility feeders and additional gear. Steam turbine-driven centrifugal machines would have involved the installation of a high-pressure steam plant, high-pressure heat exchangers to generate high-temperature hot water for heating, and considerable additional auxiliary equipment. The building would also have had to be considerably larger to house all the additional and larger equipment.

Port Authority engineers, consultants, and engineers of Carrier Corp. discussed the use of high-temperature hot water for lithium bromide absorption machines instead of the usual low-pressure steam as generating medium. With the concurrance and cooperation of Carrier Corp. engineers, this type of machine was designed, built, and installed. The result is an integrated plant of simple design, with few moving parts and a minimum of auxiliary equipment.

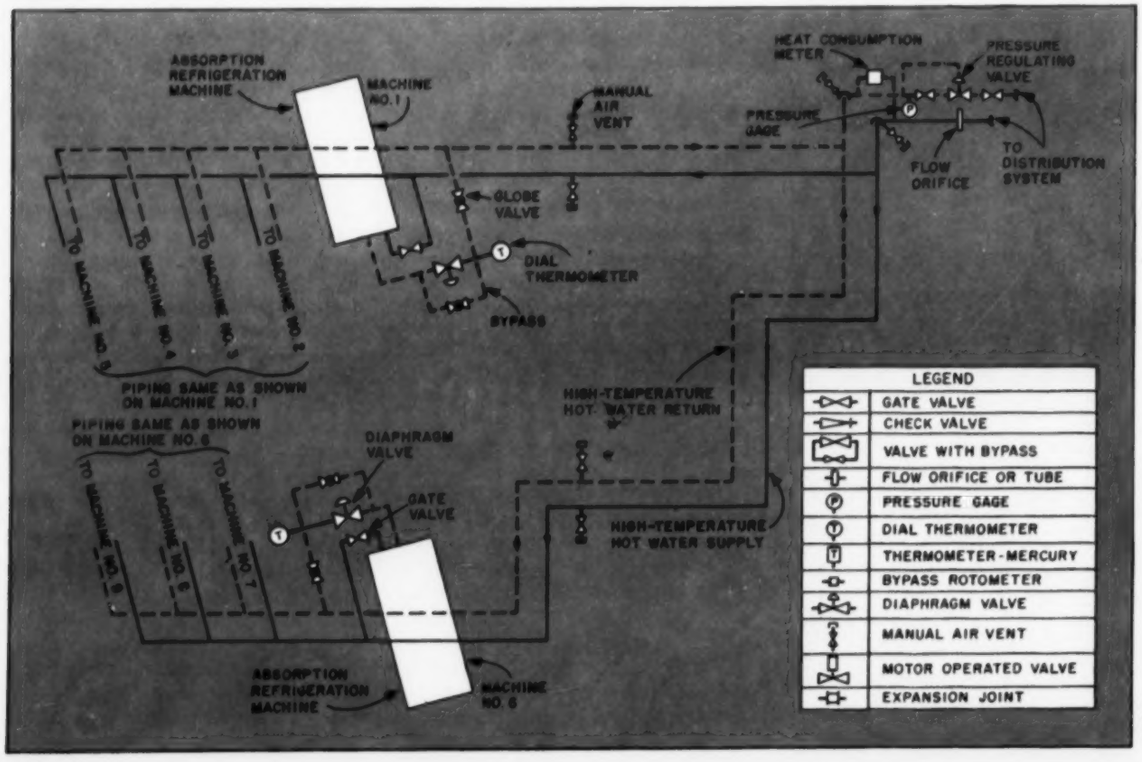
Nine Carrier absorption refrigeration machines, each capable of producing 700 tons of refrigeration, are housed in the longer wing of the L-shaped plant building. The machines are charged with solutions of lithium bromide salt, and with a quantity of pure water which acts as the refrigerant. The refrigerant water is sprayed on a chilled water coil located in the evaporator tank. When it comes in contact with the chilled water circuit coil, heat is transferred to the refrigerant water causing it to evaporate. The heat is then carried by the refrigerant to the lithium bromide solution in the bottom half of the absorber shell. Rapid absorption of water vapor formed is due to the lithium bromide solution, which produces the high vacuum necessary to evaporate the refrigerant water. The absorption ability of lithium bromide solution is reduced as it soaks up water vapor. A generator pump transfers the weak solution to the bottom section of the generator shell, where high-temperature hot water in a coil evaporates water from the solution. This concentrates the solution, which flows back to the absorber. Water vapor driven off in the generator is condensed in the top part of the generator shell by water flowing through a condenser coil. Condenser water from the cooling towers first flows through the strong solution in the absorber shell, picking up heat generated during absorption and the heat remaining in the solution from contact in the generator with the high-temperature hot water. It then returns to the condenser coil in the generator unit, before going back to the cooling towers.

High-temperature hot water for the machines is supplied by distribution pumps in the hot-water system. The chilled-water controller regulates hot-water flow so that salt solution strength is maintained at the proper level for absorption and consequent chilling control.

Chilled water returns from the terminal buildings at 55 F and is pumped through refrigeration machines, where it is cooled to 45 F. There are six parallel-connected chilled-water pumps in the refrigeration wing of the building. Each of these Worthington centrifugal pumps has a capacity of 2800 gpm at 150-foot discharge head. Pump bearings are ball-bearing type, grease lubricated.

chilled water flows in closed circuit

Chilled water flows through a closed circuit, through the distribution main in a trench to the valve pit in front of the plant building. Here the chilled water is zoned into four zones and parallels the high-temperature hot-water routes.



Piping diagram of high-temperature water system for absorption refrigeration machines in central plant.

In the user buildings, chilled water goes through closed cooling coils for air conditioning. To prevent contamination, it is not used as an air washer or cooling spray. The circuit is completed with the return water going through the refrigeration machines for recooling.

Absorption machines and chilled-water pumps are placed on the line as the load from the user buildings varies. They are controlled at the front skirt of each unit by a single start-stop button. Once started, complete internal wiring, controls, and interlocks make the units completely automatic. Any deviation from proper operation or flow failure in any circuit will stop the machine until the fault is corrected. Manual starters for the chilled-water pumps are on the motor control center.

A start-stop pushbutton is also located at each pump unit for local control. A maximum flow of 16,800 gpm of chilled water can be sent through the circuit.

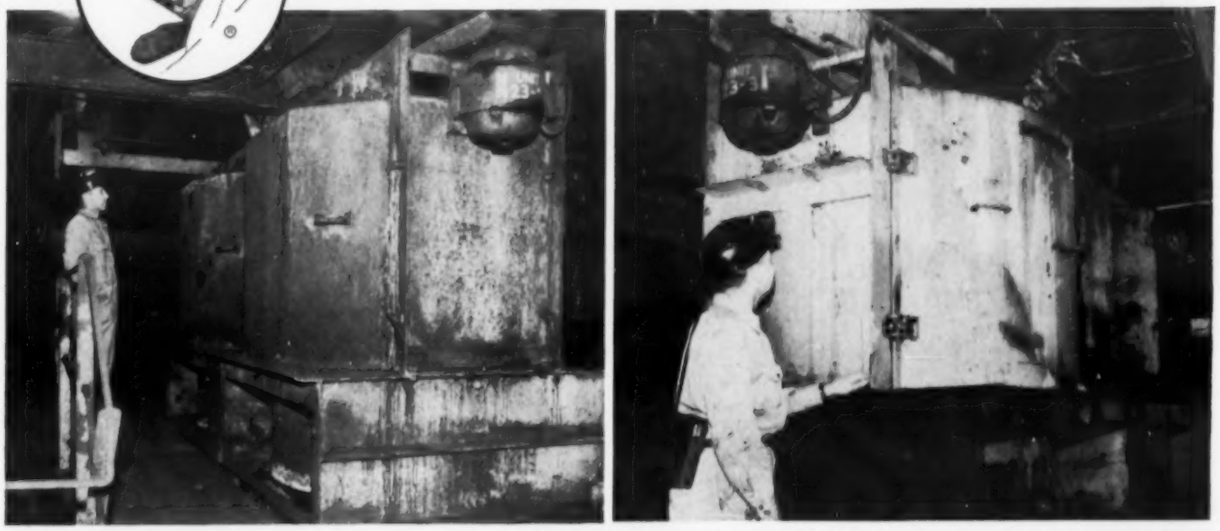
A chilled-water expansion and balancing tank is provided in the system. It is a closed tank with an air cushion provided by the plant air compressor. Tank level is maintained with makeup water under float control. When the level becomes too high, a float-controlled overflow valve relieves water to drain.

cooling towers supply condenser water

Condenser water for the absorption machines is supplied by condenser water pumps from the cooling towers. Water from the tower sumps is pumped by the condenser pumps through the absorption machines. Water leaves the machines at approximately 103 F and flows back to the towers for recooling. Six Worthington condenser pumps are located in the refrigeration wing of the building, each with a capacity of 4100 gpm at 100-foot head. Each pump must be started manually from the motor control center, depending upon the absorption machine load. There is a start-stop pushbotton at the unit for emergency use.

Two cooling towers are located at the rear of the main plant building. They are three-cell units with redwood structural members, fill, eliminators, and distribution members. The outside skins are corrugated Transite, and basins are rein-

WHY CHESSIE'S RAILWAY IS FIRST IN COAL



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For dependable deliveries of top quality coals, contact coal producers on the C&O. And for specific help in meeting your own fuel requirements, write to: R. C. Riedinger, General Coal Traffic Manager, Chesapeake and Ohio Railway Co., Terminal Tower, Cleveland 1, Ohio.

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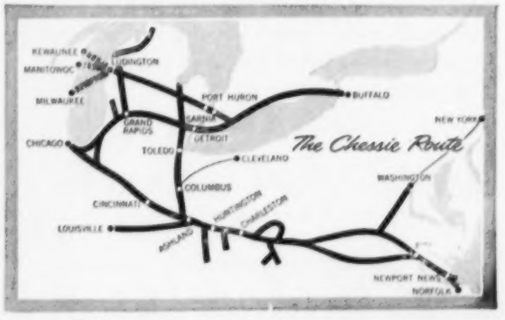

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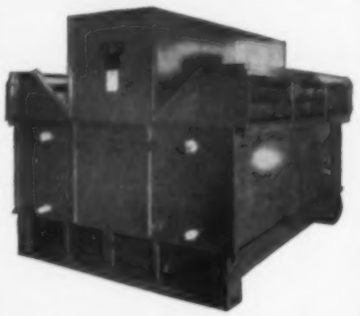

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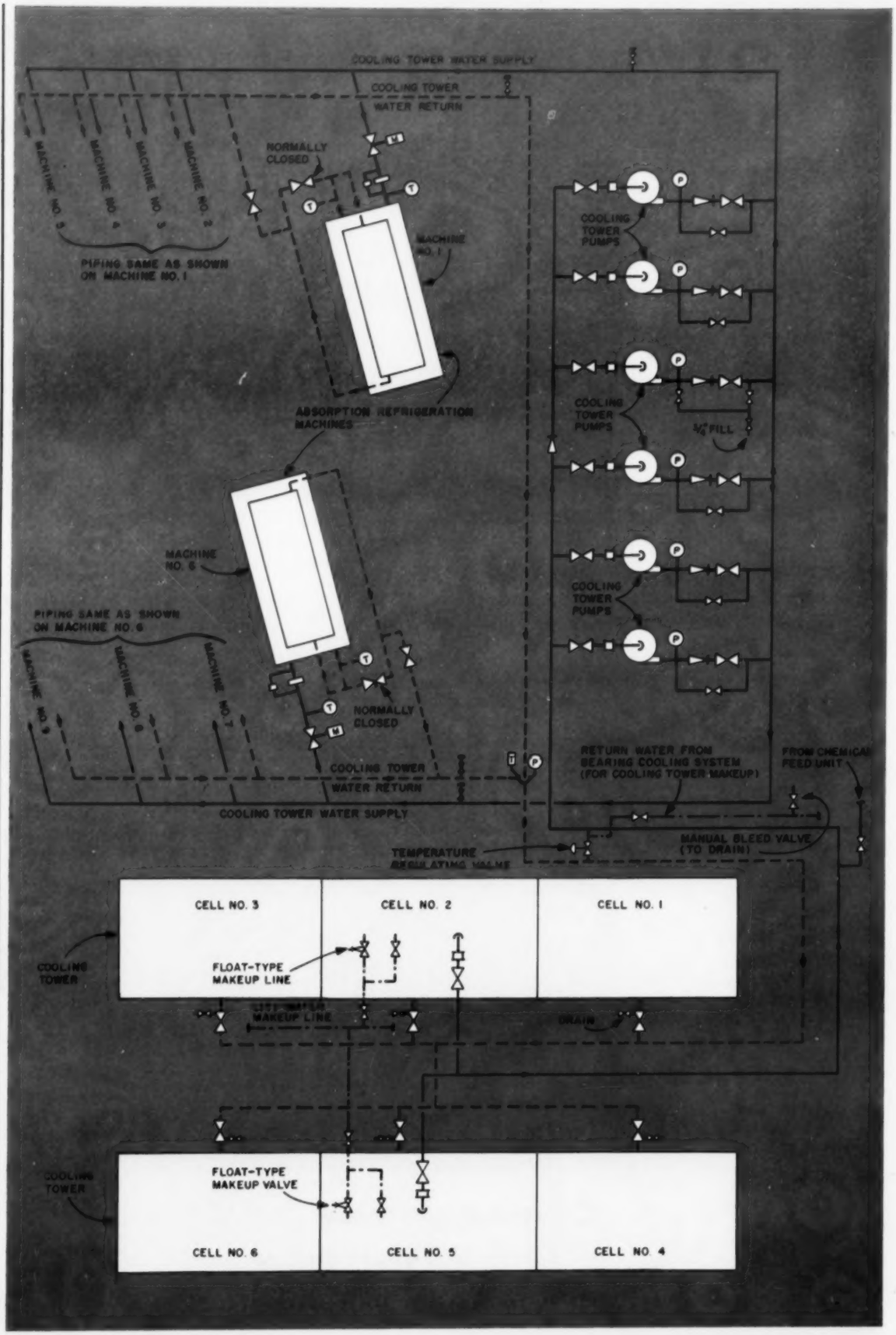
District Engineers in Principal Cities of U. S. and Canada



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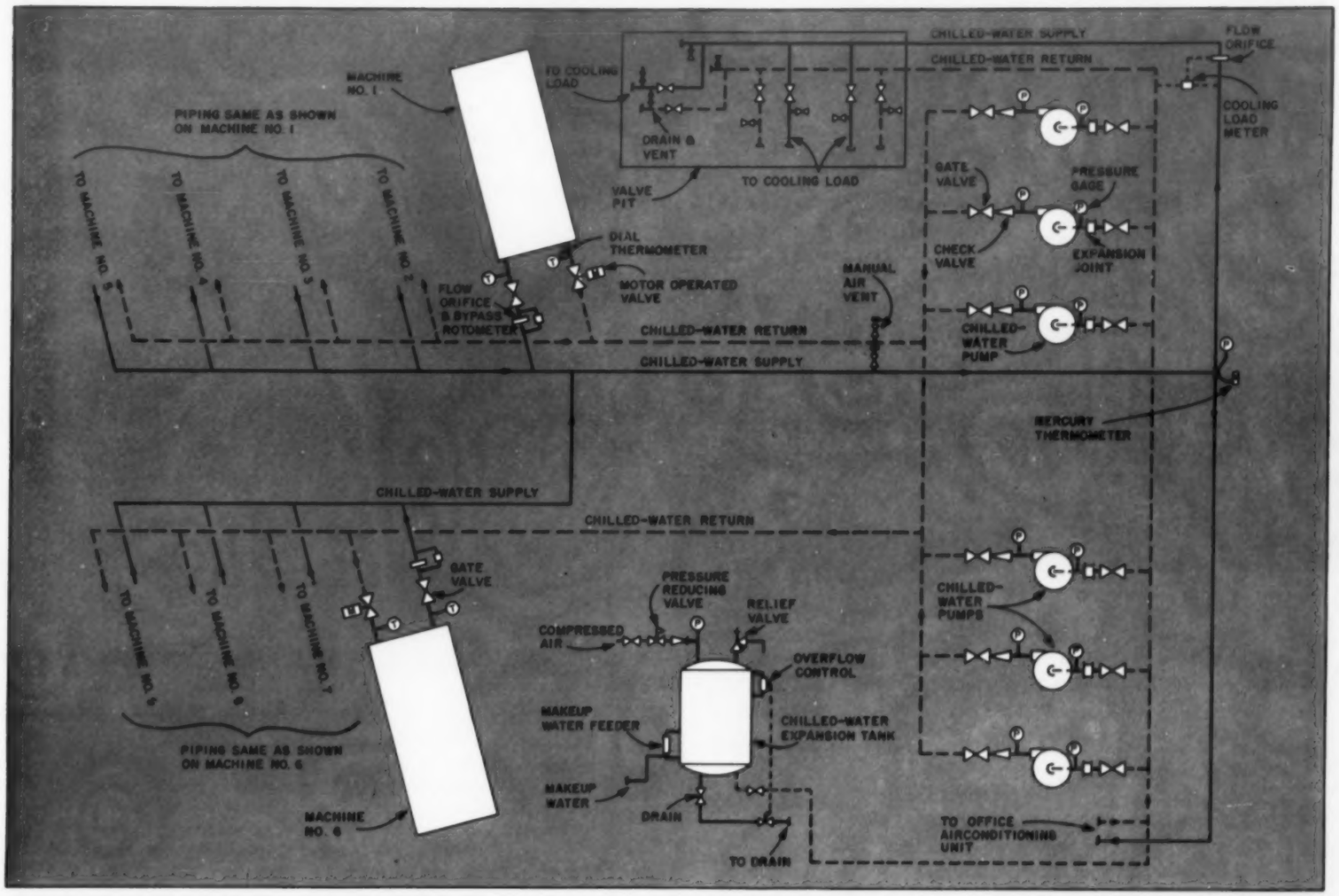

Piping diagram for chilled water system indicates simplicity achieved through use of absorption refrigeration. Plant is designed for minimum maintenance.

forced concrete. There is only one basin and suction sump for each tower. Water from all cells in the tower mixes before going to the suction pumps. The top deck supports the air fans and drives, and is useful for maintenance.

Induced draft-type towers pull air up through the tower, through the fill, and over the wetted surfaces to cause water evaporation and cooling. The cells can be isolated so that air flow for each cell will be separate. Each tower is 110-feet long, 30-feet wide, and approximately 35-feet high overall. Total cooling capacity for both towers is 24,600 gpm of water from 102.4 F to 85 F when outside air temperature and humidity give a 78 F. wet bulb temperature.

◀ *Piping diagram of cooling tower water system. Two towers, behind boiler plant, have three cells each.*

Towers were constructed by the Phillips Cooling Tower Co. Induced-draft fans have stainless steel, variable pitch propeller-type blades and are capable of delivering 455,000 cfm against a static pressure of 0.65 in. wg. The Moore Co. fans are driven by 100-hp Louis Allis Co. squirrel-cage motors through Cone Drive speed reducers. Each cell has its own induced-draft fan. Each combination fan starter on the motor control center must be operated manually when the cell is added to or taken off the system.

Water from the condenser piping, under pump head, enters a distribution trough at the top and flows through an independent water distribution system in each cell. Flow then goes to a series of smaller finger troughs covering the area of each cell. In the bottom of each finger trough, spouts are located on 18-inch centers. Water flows through the spouts onto splash plates and down through the wood fill of the cell. Moisture eliminators located between the troughs remove entrained droplets of water before they enter the fan.

A makeup water valve for each cell allows makeup water, under float control, to enter from the city water supply. Some evaporation loss is made up from the bearing cooling water from the hot-water and hot-water circulation systems.

all pipe lines are anchored, protected

Chilled-water lines, like high-temperature water lines, are anchored to precast concrete slabs and run parallel to the hot-water lines. Due to the small differential between supply and return line temperatures and the normal ground temperature, the small expansion and contraction in the pipe is taken up by the pipe itself. No other provision has been made for expansion. Total run of pipe for the chilled-water distribution is approximately 4 miles. Pipe sizes range from 5- to 20-in. dia in thin-wall pipe. One inch of polystyrene was wrapped and coated with asphalt to form insulation and also to provide protective covering for the pipe. The trench was then back filled. ♦ ♦

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Industry Power
Reader Service Dept., St. Joseph, Mich.

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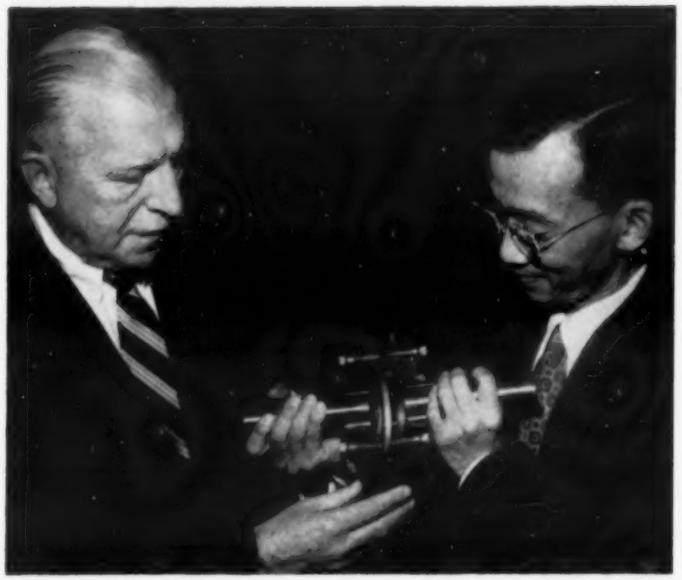
Ip new products

700 Flexible coupling uses rubber tire



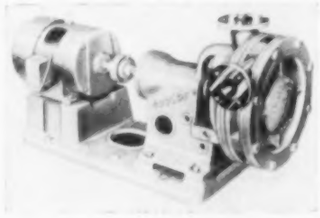
Para-flex flexible coupling withstands simultaneous angular misalignment to 4 degrees, parallel misalignment to 1/8 inch, end-float misalignment to 5/16 inch. Coupling has flexible "tire" clamped between two flanges mounted on shafts to be coupled. Flexible member is held between hub flanges and clamp rings. Molded transverse split simplifies installation, permits easy replacement. No lubrication is needed because coupling construction eliminates metal-to-metal contact. Available in capacities to 600 hp at 900 rpm. DODGE MANUFACTURING CORP.

701 Metal packings for high pressures

Shredded metal packings for high steam pressures and temperatures are made of copper tinsel treated with special rubber cements, graphited throughout, and molded to shape. Use against steam, air, water, or gases (except ammonia) on valve stems, reciprocating rods, and rotary shafts of pumps, compressors, etc., for temperatures to 1500 F. Metal adapters are available to customer's specifications with different degree of bevel. GARLOCK PACKING CO.

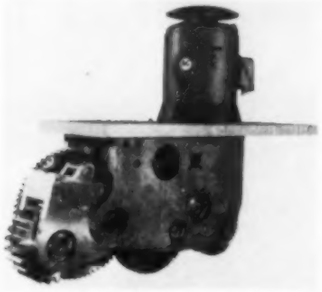
702 Glassed pump won't corrode

All parts coming in contact with liquid handled by centrifugal pump are glassed for corrosion resistance and cleaning ease. Specially fused glass withstands quick temperature changes. Sharp impact can damage glass only at impact point — fusing prevents spread of break. Pump handles heads of 140 feet, capacities to 700 gpm. Wide openings on support head give easy access to seal or optional gland and stuffingbox. GOULDS PUMPS, INC.



(703) Two-speed turning gear

Underslung two-speed turning gear for steam turbo-generator units 100 mw and above rotates spindles of 1000 F or 1050 F turbines during preheating, rolling, and cooling periods. Di-



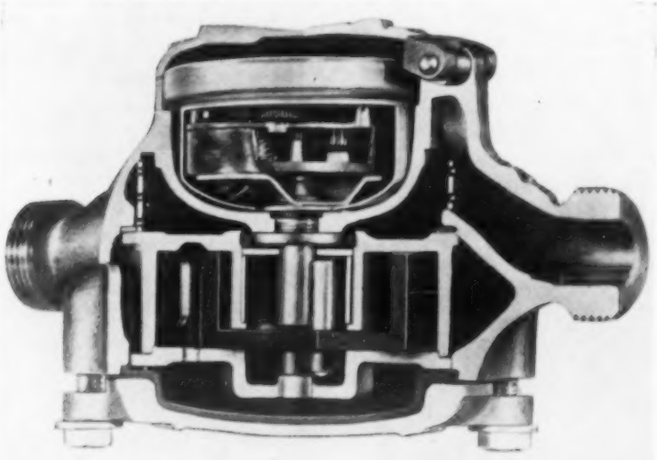
ametral temperature gradients of spindles and casings are kept low to avoid distortion. Gear is built into turbine pedestal at side of turbine centerline, so neither gear nor its control console need be removed or disconnected for servicing. Two free-wheeling clutches connect motor to two gear trains to provide 3 rpm for starting and higher speed for rolling ALLIS-CHALMERS MANUFACTURING CO.

(704) Test neutron flux, reactor power

Uncompensated ionization chamber monitors nuclear reactor power by measuring neutron flux within the reactor. Ionization chamber has cylinder containing two graphite electrodes. Each electrode has an inner graphite tube lined with

boron-10 on facing surfaces, making chamber sensitive to thermal neutrons. As neutron flux increases or decreases in reactor, ion density in sensitive volume between electrodes in ionization chamber also increases or decreases. Indicator attached to chamber by remote wiring reports increase or decrease. ATOMICS INTERNATIONAL

(705) Sealed register water meter operates by magnetic force



Water meter uses magnetic force to transmit motion from measuring chamber to hermetically sealed register. Design eliminates stuffingbox and separate intermediate gear train. Only two moving parts – piston and piston-roller – are in contact with water. Sealing register eliminates fogging of register glass, protects gearing against dust and atmospheric corrosion. Registers are straight reading, calibrated in cubic feet or gallons. Reduced friction reduces drag and improves accuracy. Design greatly simplifies routine meter maintenance. ROCKWELL MANUFACTURING CO.

(more on page 28)

RAMBLINGS ON INSTRUMENTATION

The Low-Down on Boiler Plant Control Systems

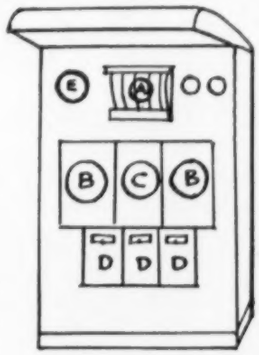
As you may or may not know, our company is up to its fetlocks in boiler plant instrumentation. We design instruments and controls, manufacture them, fuss over them, argue about them, even sit up all night with them on rare occasions. We've been at it for twenty years or so, in which time we've sold hundreds of systems.

And we're rather proud of the fact that, by and large, our systems have done what they are supposed to do, extremely well . . . making tight-lipped treasurers chuckle over lowered costs . . . causing dignified presidents to break out in gleeful buck-and-wings over increased efficiency . . . enabling harried engineers to enjoy carefree off-duty romps, untroubled by maintenance worries. In fact, the only people our systems seem to make unhappy are fuel salesmen who lack the broad viewpoint.

As red-blooded American businessmen, we'd like to sell more of these systems . . . particularly to you. We think a good way to go about this might be to widen the understanding of just what a system does.

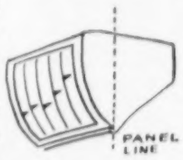
Let's start with a look at the control panel, a hunk of ¼" steel perforated like a Swiss cheese with holes for instruments.

The sketch below positions the instruments most generally found on any panel. To wit: (A) draft gauges, (B) flow meters, (C) some type of combustion guide, (D) an integrated group of controllers and (E) pressure gauges.



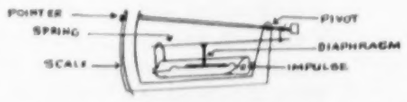
Boiler plant engineers being the independent cusses they are, you seldom see two panels exactly alike. But the basic jobs of all the gadgets on any panel is simply (1) to provide information and (2) to automatically control variables.

Let's take a look at one of the fundamental "information-providers" on the panel—(A) the Draft Gauge. This is the sensitive stethoscope of the power plant engineer. With it, he can observe variations in gas or air pressures and draft. To his experienced eye, every variation has its meaning. Is there proper flow of air into the boiler? Is soot building up in the boiler tubes? Is the condition of the fire bed satisfactory? Has a fan conked out?



To save panel space and facilitate "human scanning" for trend information, boiler plant draft gauges are usually banked in series from 2 to as many as 24.

Most of them utilize a slack leather diaphragm—first used by Hays and widely adopted by others (who shall remain nameless). They operate like this:



Hays has a special model, the "W" Gauge, engineered just for the boiler plant. We're biased, but we think it has some really fine features, such as:

readability—can be read at 25-30 ft.
accuracy—2% of scale
appearance—smart, aluminum case
overpressure—100% of range
zero adjust—front or bottom

Our spec sheet 56-1180-31 is loaded with data on this instrument. Why not send for it? Next month: "Flow Meters."

Phil Sprenger Jr.
President

THE HAYS CORPORATION • MICHIGAN CITY, INDIANA

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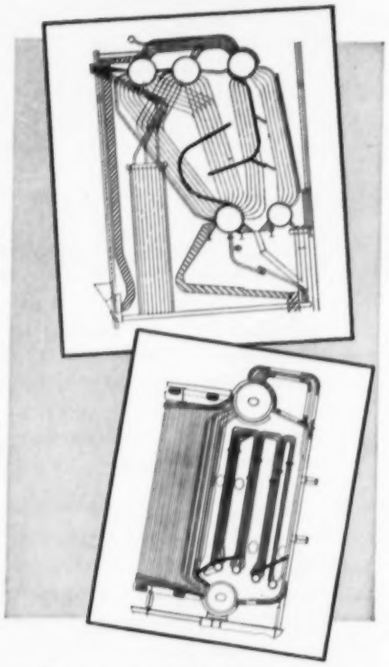
ONLY ENCO BAFFLES

give you all these

COST CUTTING FEATURES



These important fuel-saving maintenance-reducing features are obtainable with Enco boiler baffles—*and only with Enco baffles.*

- **Streamlined gas flow**
- **Uniform gas flow**
- **Elimination of bottlenecks**
- **Reduced draft losses**
- **Higher heat transfer**
- **Cleaner heating surfaces**
- **Less use of soot blower**
- **Special provision for expansion**
- **Easy tube replacement**
- **Adaptable to any water-tube boiler, fired by any fuel**

Each application is designed on the basis of more than a quarter century of experience in this specialized branch of power engineering. Installations are made by skilled mechanics.

THE ENGINEER CO.

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In Canada: Rock Utilities Ltd., 80 Joan Talon St. W., Montreal, P. Q. EC-806

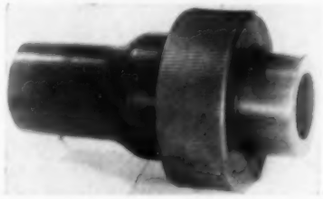
Circle 106 on READ-N-CIRCLE card

IP new products

. . . starts on page 26

706 Use PVC check valve in any position

All-polyvinyl chloride lift check valve operates in vertical or horizontal position. Opens and closes under less than 6



pounds pressure. Only moving part is self-energizing disk. Available in 1/2- to 3-inch sizes, threaded or socket-welding types. Material is normal impact PVC. TUBE TURNS PLASTICS, INC.

707 Air-powered hoist lifts 4000 pounds

Lifting and lowering speed of 4000-lb capacity air-powered hoist varies from a creep to 10 ft/min at full load and 90 psig air line pressure. Hoist operates with either a one-hand control

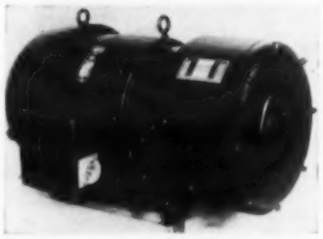
bar or remote pendent control. Centrifugally governed mechanical brake permits operator to retain control of load should air supply fail. Hoist has swivel-mounted safety suspension and load hooks. Hook-to-hook dimension is 23½ inches. KELLER TOOL DIV., GARDNER-DENVER CO.

708 Transformer is lighter, quieter

Single-phase distribution transformer has lower sound rate — below 46 db for 167 kva, for example. New design reduces overall weight of units in line from 8 to 32%. Single-phase ratings are from 25 through 167 kva, three-phase ratings are from 45 through 300 kva. Available in 600- and 5000- volt insulation classes. WESTINGHOUSE ELECTRIC CORP.

709 Converter eliminates sparking

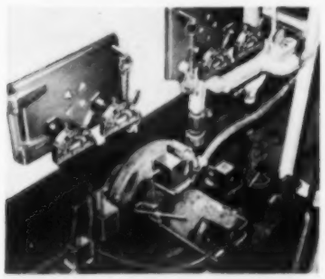
Lightweight (under 500 pounds) frequency converter unit delivers 400 cps, 3-phase,



120/208 volt, 15 kva continuous. Totally enclosed fan-cooled motor operates at 1800 rpm from 220/440 volt 3-phase, 60 cps supply. Simplified design eliminates regulators and brushes. GEORATOR CORP.

710 Air preheater speeds combustion

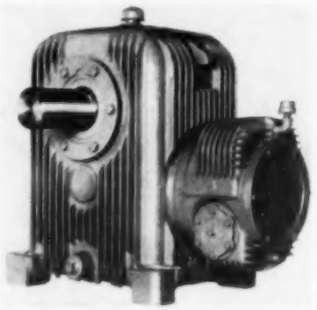
Air preheater that installs in boiler fire door evenly delivers preheated secondary air at 400 F over fire bed or burners for



maximum fuel combustion, less smoke and soot. Preheating chamber, of a heat-absorbing alloy, is heated by radiation of hot air within the boiler, so consumes no fuel energy usable for boiler operation. Preheater can be used with high- or low-pressure boilers firing oil, coal, or coke. THE PREHEATER CORP. OF AMERICA.

711 Worm gear speed reducers from stock

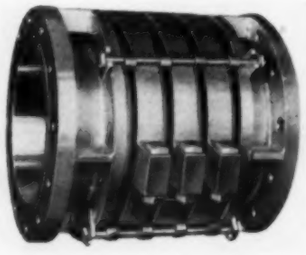
Standard primary double-reduction worm gear speed reducers in 13 basic sizes provide maximum ratios to 4900:1, maximum output torque to 618,-



000 inch-pounds. Available with worm over or under, gear shaft vertical in right- or left-hand or double extended shaft assemblies. Water cooling coils optional in sizes over 3-in. center distance. CONE-DRIVE GEARS DIV., MICHIGAN TOOL CO.

712 Expansion joint is self-equalizing

Corrugated self-equalizing expansion joints protect piping from temperature change damage by distributing pipe line expansion to all corrugations in



equalizing rings. Reducing ratio of expansion joint length to diameter gives greater stability at high pressures. Stainless steel joints come in 3-in. dia to 72-in. dia in single or double units for pressures to 300 psig, temperatures to 1600 F. Copper joints also available for copper and brass piping. ZALLEA BROTHERS.

(713) Solve those paint-peeling headaches

Galvinoleum coatings can be used on unpainted galvanized, aluminum, or terne plate surfaces for lasting protection without peeling. No surface etching or weathering needed before painting. Comes in red, gray, green, and metallic colors. Oil-base house paint may be used over Galvinoleum if desired. RUST-OLEUM CORP.

MORE INFORMATION

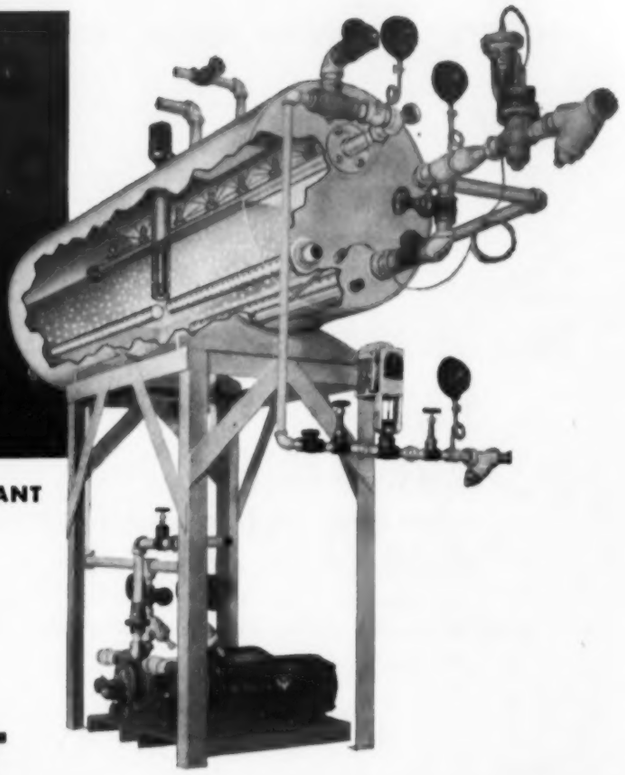
For more detailed free information on these products just circle the key numbers on a READ-N-CIRCLE card on page 45 or 46.

(714) Hoist, crane cord reel

Cord reel for supplying current to electric hoists, cranes, etc. having motors from 110 volts, 1/2 hp to 440 volts, 7 1/2 hp has swinging guide that rotates through an arc of 290 degrees. Four rollers feed cord in any direction – even at right angles to reel – without damaging cord. Choice of No. 14 or 16 wire. SHAW-BOX CRANE & HOIST DIV., MANNING, MAXWELL & MOORE.

(more on page 30)

SCHAUB "03" DEAERATOR



FOR THE SMALL TO MEDIUM STEAM PLANT

- Combats "Return Line" Corrosion
- Guarantees Oxygen Removal to .03 cc/liter
- Simpler in Principle and Operation
- Pays for Itself in Savings

HOW TO CUT CORROSION COSTS without Breaking Your Budget

If your steam needs are in the 3,000 to 30,000 lbs./hr. range the Schaub .03 Deaerator was designed with *you* in mind.

It is in plants of this size range — often operating at low pressure — that "return line" corrosion is most likely to be a continual costly maintenance item. A Schaub .03 Deaerator effectively combats this and at very low cost. It is equally applicable to high pressure installations.

The *big* difference between the Schaub .03 and other low-cost deaerators is that it operates *fully vented* at atmospheric pressure for better gas removal. Yet wasteful steam vapor loss is prevented regardless of load variations by the simple, but effective Schaub spray-contact vent condensing method. Other exclusive features that boost efficiency are pin-point temperature control and "live action" heating of storage water. This provides more forceful "break-away" of air molecules.

With fully vented design, no premium-cost pressure construction is needed and maintenance and operating costs are reduced to a minimum. Rust-proof Chromosoid lining adds years of trouble-free life.

NOTE: For boiler capacities up to 100,000 lbs./hr. and .005 cc/liter oxygen removal, write for Bulletin *575*, describing the unique Schaub Zero-Oxygen Deaerator.

SEND FOR BULLETIN 1300

The full facts on the "hows", "whys" and basic differences in the Schaub .03 method. Filled with facts for the operating or consulting engineer responsible for boiler feedwater deaeration.

FRED H. SCHAUB ENGINEERING CO.

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FRED H. SCHAUB ENGINEERING COMPANY
2115 South Marshall Blvd., Chicago 23, Illinois

Please send me, without cost or obligation, my personal copy of your new Bulletin 1300 on Boiler Feedwater Deaeration.

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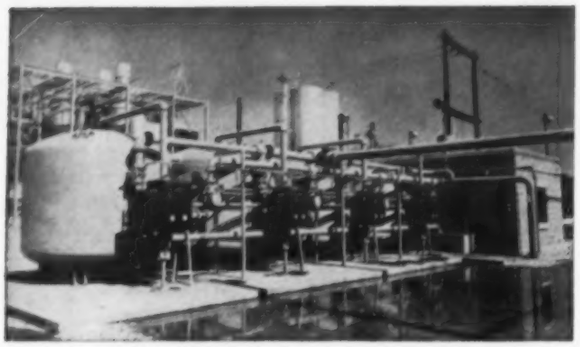

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(for over half a century)

Complete plants for water softening, demineralization, silica removal, de-oiling of conrensate, clarification, de-alkalizing and all other requirements.

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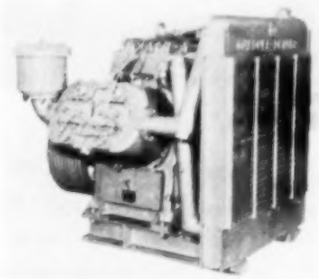
Ip new products

. . . starts on page 26

715 Air compressors save valuable space

This 200-hp, 1150 cfm, two-stage package air compressor unit occupies only 34 square feet of floor space. It can be used with tube-type intercooler or with self-contained radiator



intercooler. No special base is needed. Unit may be bolted to floor, hooked up and put in immediate operation. GARDENER-DENVER COMPANY.

716 Recover coal fines with flocculant

New flocculating agent removes suspended solids from coal washing waters. Low concentrations of agent added to slurry causes rapid and thorough aggregation of finely divided coal particles. Flocculants re-

cover fine coal of commercial value, permit reuse of water, and reduce solids content to conform with stream pollution regulations. As little as one pound of the synthetic resin will treat up to 300,000 gallons of coal slurry. B. F. GOODRICH CHEMICAL COMPANY.

717 No couplings in circulating pump

Special construction of circulating and coolant pumps for sidewall or immersion mounting have no stuffing boxes, no pump bearings, and no couplings, thus eliminating much routine main-

tenance. Long shaft construction permits high liquid levels. Vent holes in supporting head protect motor if liquid level should become too high. Sidewall-mounted units in 1/4 to 5 hp deliver to 180 gpm at 90-ft head. Immersion types range from 1/4 to 10 hp to deliver 500 gpm at 160-ft head. INGERSOLL-RAND.

718 Bronze valves for copper tubing

Bronze globe, gate, and check valves with solder-joint sockets are designed for use

with K, L, and M copper tubing for steam, water, oil, and gas lines. Globe valve has a

service rating on steam of 150 psig; on nonshock cold water, oil, and gas rating is 300 psig. Gate and check valves have 125-psig rating on steam and 200-psig rating on cold water, oil, and gas. Gate and check valves are available in 7 sizes from ⅜ to 2 inches. Globe valve is in 10 sizes from ¼ to 3 inches. WALWORTH CO.

(719) Range finder measures to 100 ft

Sturdy pocket-size range finder operates on principle of coincidence of two images to measure inaccessible objects and places. Gives accuracy within

2%. Operator sighting through eyepiece views two images. Turning knob causes images to move closer to each other. Adjustment is complete when both images coincide. Operator then reads distance to object on dial. EDMUND SCIENTIFIC CO.

(720) Direct fired space heater

Stainless steel direct-fired 4-pass space heaters have capacities from 400,000 to 2 million Btu, will burn fuel oils through No. 5, or natural, mixed, manufactured, or LP gas. Combination gas-oil units have interchangeable burners or single burner that changes to second fuel by flick of a switch. REZNOR MANUFACTURING CO.

(721) Switchboard opens at front

Standardized 14-inch deep switchboards for services from 400 to 2000 amps give com-

plete accessibility from front. Service sections with standard current transformer compartments for power plant use are available in hot or cold sequence with a main breaker or main switch. SQUARE D CO.

(722) Thermometers for -40 to 950 F

New thermometer series includes recorders, recorder-controllers, indicators, and indicator-controllers. Uniform accuracy over the entire scale is

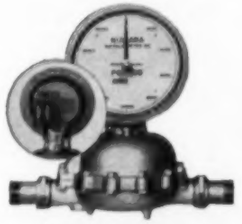
assured by using mercury-actuated sensing elements. Contact ratings for non-inductive loads are 10 amps at 115 volts, and 5 amps at 230 volts. Temperature range of the series is from −40 to 950 F. WHEELCO INSTRUMENTS DIVISION, BARBER-COLEMAN COMPANY. ♦ ♦

• Standardize Quality

• Aid Cost Control

• Promote Efficiency

Niagara Chemical Meter with set-back register.



Niagara Electricontact Meter with explosion-proof microswitch.

Niagara Oil and Specialty Meter with 10" dial.

Niagara Liquid Meters contribute to the quality and uniformity of your product, because they do more than measure. They help to maintain consistent and accurate cost. They reduce waste and thus promote efficiency.

In hundreds of applications they prove their versatility of use. To name a few: Niagara Chemical Meters measure and control use and processing of most liquid chemical solutions. Fuel Oil Meters measure oil burned in boilers and permit oil consumption to be compared with the water evaporated to determine boiler efficiency. Syrup meters control this vital ingredient as used in candy or ice cream. Hot water meters measure water used, condensate returns or boiler feed water. Even cold water metering is highly profitable by avoiding waste in the control of batch measurement or processes using cold water. In each case the Niagara Meters are monitors of quality or cost control, not just recorders of the number of gallons passed through them.

Let us tell you what Niagara Displacement Type Liquid Meters can do for you. Write us or use coupon below for prompt reply.

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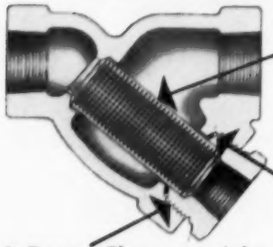

Lasts Longer—stainless steel screen is standard at no extra cost.

Won't Blow Its Gasket—blowout-proof stainless clad asbestos gasket is locked in place between bushing and body.

Is Easy to Clean—straight bushing threads make screen easy to remove . . . never any "freezing" or rusting in.

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to heat water fast, at low cost

In the Johnson Heater, water to be heated is routed first inside, then outside, a blanket of live steam. It's full pressure steam, too; up to 150 lbs., or 250 lbs. in heavy duty types, no reducers are needed. The result: faster, more efficient heat transfer for a unit of its size. No wonder industry has found so many applications for the Johnson "Instant" Heater, in heating water and process liquids of various types.

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Sizes for all needs; write for literature

The Johnson Corporation

807 Wood St., Three Rivers, Mich.

Ip handy guide to engineering literature

AIR CLEANING EQUIPMENT

142 Stop dust where it starts

Chem-Jet controls dust before it becomes airborne. Veil of specially treated moisture applied at dust trouble spots stops all dust particles. Read page 10 — Johnson March Corp.

138 Bag-type dust arresters for heavy-duty service

Dependable, heavy duty dust collection at low operating and maintenance cost. Cyclic bag shaking and cleaning gives outstanding efficiency. Read page 37 — The Northern Blower Co.

400 Dust collection manual

"The Collection and Recovery of Industrial Dusts," Manual 101, discusses types of dust, techniques used in analysis. Buell Engineering Co., Inc.

600 Contaminants in the air

Special industry report on air pollution describes various contaminants and troubles they cause, legal aspects of air pollution. Special report from Industry Power. (Single copies free — 2 to 24 copies, 25¢ each. Quantity prices on request.)

AIR CONDITIONING, HEATING, VENTILATING

104 Efficient man-cooling

Airplane-type Heat Killer cools large areas, cures hot working conditions. Read page 44 — Coppus Engineering Corp.

109 Cut cost of air conditioning

Here's an economical way to cool your building. Easily installs on any roof. Read page 42 — Ruppright Rotary Roof Cooler.

119 Do you have space heating problems

Stainless steel direct-fired heaters install easily. Operate automatically, need little maintenance. Read page 36 — Reznor Manufacturing Co.

401 Engineering specs on propeller fans

Revised specifications, performance data, and dimension drawings on entire line of propeller fans are contained in Bulletin A-109B. Forty pages. Hartzell Propeller Fan Co.

420 Fans handle high static pressures

Handy charts in Bulletin 400 give ratings in cfm and hp against resistance for Aerovent semi-pressure 7-blade fans from 14- to 60-in. dia. Eight pages. Aerovent Fan Co. Inc.

BOILERS, ACCESSORIES

105 Get hot water fast, economically

Heater uses full pressure steam up to 250 psi. Read page 32 — The Johnson Corp.

107 Save with package steam generators

Save time, space, maintenance with package steam generators. Send for details. Read page 33 — Foster Wheeler Corp.

106 Baffles cut costs, save on fuel

Save fuel and reduce maintenance costs with Enco boiler baffles. Read page 28 — The Engineer Co.

123 Troublefree boilers for 50 years

One boiler user states a Leffel boiler has been used almost 50 years without repairs from mechanical failure. Read page 34 — The James Leffel & Co.

134 Two-color readings on boiler gage

Color-Port boiler water level gage for pressures to 3000 psi gives vivid two-color readings. Read page 12 — Yarnall-Waring Co.

130 Forced recirculation generators

More and more engineers specify forced recirculation generators. Counterflow economizer preheats return water. Read page 4 — The International Boiler Works Co.

402 **Package boiler capacity tables**

Bulletin PSG-2 contains tables of capacities, dimensions, and weights of nine typical package boilers. Includes illustrations of firing and control equipment plus recommendations for field installation for three pressure-classes available. Ten pages. HENRY VOGT MACHINE CO.

601 **Case history of outdoor package boiler**

Shell Development Laboratories decided to install package boiler outdoors in spite of hazardous location. Here is case history of boiler's installation and performance. Tearsheet from March 1955 INDUSTRY POWER.

602 **Steam packaged for expansion**

Additional package steam generators with automatic controls give Rapids-Standard Co. sufficient steam for present and estimated future space heating needs. Intelligent approach to future expansion solves heating problems before they start. Reprinted from December 1956 INDUSTRY POWER.

603 **Check that steam drum**

Before buying a water-tube package boiler, check steam drum sizing, type, optimum arrangement of internals, and their accessibility for maintenance. Be sure your new steam drum can do the job you require. Reprinted from April 1956 INDUSTRY POWER.

604 **Thermodynamics basics**

Seven-part series on thermodynamics basics from concepts and definitions through computing steam powerplant heat balances. Text is amplified by charts and diagrams, sample problems. Fifty pages. Reprinted from INDUSTRY POWER. (50¢ per copy — quantity rates on request.)

COMMUNICATIONS

136 **Warning system saves lives, money**

Adequate warning system forewarns of danger. Also serves as paging, start, and dismissal signal. Read page 49 — FEDERAL SIGN AND SIGNAL CORP.

CONSTRUCTION MATERIALS

132 **Do you have sheet fabrication troubles?**

For specialized help on sheet and plate component fabrication, call on the specialists. Company offers 50 years' experience in fabricating carbon steel, stainless aluminum, Monel, other alloys. Read page 26 — KIRK & BLUM MFG. CO.

How to estimate construction costs

"Estimating Construction Costs," by R. L. Peurifoy, A and M College of Texas professor, is guide to understanding methods of estimating construction costs of engineering projects. Project cost is divided into materials, overhead, labor, equipment, and profit. Methods of determining both approximate and detailed project costs are covered. While prices quoted in book cannot be assumed to apply to all projects in any locale, general method of determining costs is applicable anywhere. Handy building estimate checklist aids in estimate preparation. Construction equipment depreciation schedule is also useful. 316 pages. $8.50. MCGRAW-HILL BOOK CO., INC., 330 W. 42nd St., New York 36, N.Y.

CORROSION CONTROL

140 **Cut boiler corrosion costs**

Schaub .03 deaerator combats return line corrosion safely, economically for steam plants in 3000 to 30,000 lb/hr range. Read page 29 — FRED H. SCHAUB ENGINEERING CO.

403 **Coal tar coating in tape form**

Tapecoat-X protects pipe, pipe joints, fittings, couplings, tanks from corrosion. Self-bonding, easy to apply with a torch. Can be used with primer if desired. Comes in rolls of 2-, 3-, 4-, 6-, 18-, and 24-inch widths. Four pages. THE TAPECOAT CO.

ELECTRIC DISTRIBUTION

118 **Bring voltage to normal with transformer**

Buck and boost transformer corrects voltage to normal for

Handy Guide Subject Index

Air cleaning equipment 32
Air conditioning, heating, ventilating 32
Boilers and accessories 32
Communications 33
Construction materials 33
Corrosion control 33
Electric distribution 33
Electric utilization 34
Engines: diesel, gas, steam 35
Fire protection 35
Fuels and firing equipment 35
Heat exchangers 35
Instruments and controls 36
Lubrication 36
Maintenance items 36
Materials handling (bulk) 37
Mechanical power transmission 37
Piping, tubing, and hose 37
Pumping equipment 37
Refractories and insulation 50
Refrigeration 50
Traps, strainers, and separators 50
Valves and regulators 50
Waste disposal 50
Water supply and treatment 51

new Misericordia Hospital will

SAVE THREE WAYS*

BY INSTALLING

FW PACKAGED STEAM GENERATORS

Lowering one of the 43,500 lb FW Packaged Steam Generators into the basement of the Misericordia Hospital.

SCHEDULED for completion early in 1958, the $8,000,000, 210-bed Misericordia Hospital, Bronx, N.Y., will be fully equipped with the finest and most modern facilities obtainable.

All steam requirements will be supplied by three fully-automatic Foster Wheeler Packaged Steam Generators, each rated 17,500 lb/hr at an operating pressure of 125 psi. Each two-pass steam generator contains 1857 sq ft of heating surface and generous furnace volume. Staggered tube arrangement permits a high heat transfer rate and low exit gas temperatures.

FW Packaged Steam Generators are available in capacities from 10,000 to 60,000 lb/hr and pressures to 1300 psi. For complete information, send for Bulletin No. PG-55-3. *Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.*

* **SAVE TIME** — because they were completely shop fabricated and delivered by truck direct to the building site, all ready to set in place and connect to power, fuel and steam lines.
* **SAVE SPACE** — because of exceptionally low ratio of unit size to quantity of steam produced. Measuring only 12'1½" high, 10'11½" wide and 16½' long, these 17,500 lb/hr units are installed on small, low-cost foundations.
* **SAVE MAINTENANCE** — because they are specially designed for easy servicing and inspection. Consisting almost entirely of water heating and steam producing pressure parts, there is a minimum of refractory and tile maintenance.

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Leffel Boilers Pass The Acid Test:

"... we have been in the boiler business for nearly fifty years, and the only repair work we have ever done on a Leffel Scotch Marine Boiler has been due to human failing, and not to mechanical failure. The Leffel Scotch Marine Boiler is without a doubt the strongest and most trouble-free boiler built."

Mr. J. J. Bower, President
J. J. Bower Company, Inc.
Roanoke, Va.

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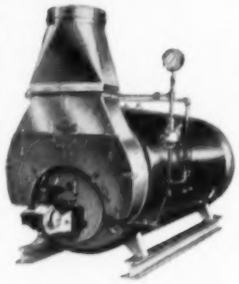
No man is in a better position to judge boilers than the man who services and repairs all types and makes. It pays to listen to a man like J. J. Bower for his words are backed by nearly a half-century of experience. In the brief statement above, Mr. Bower cuts away all the claims and promises of most of today's boiler advertising and tells you why *you* should rely on Leffel boilers for your steam requirements.

For more details on why you can count on rugged, reliable Leffel boilers for long life and dependable service, write today for your free copy of Bulletin 236.



THE JAMES LEFFEL & COMPANY
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SPRINGFIELD, OHIO

2567

COMPRESSED AIR
SEPARATOR · FILTER · TRAP
MURPHY
TRIUMPH AA

Installed near point of use, it separates and ejects moisture automatically, then filters out all scale, rust or other impurities and delivers air clean and dry; **of instrument quality.**

Write now for **FREE** Data Sheet No. 2567.

JAMCO

JAS. A. MURPHY & CO., INC.
1419 EAST HIGH STREET, HAMILTON, OHIO

IP handy guide

. . . starts on page 32

better performance from electric equipment. Read page 43 — ACME ELECTRIC CORP.

124 Dry-type transformers are quiet

Dry-type transformers have sound levels below established standards. All ratings to 3000 kva. Read page 19 — SORGEL ELECTRIC CO.

129 Nonsegregated phase bus takes less space

New bus is completely sealed, air and porcelain insulated. Installs in less space. Use indoors or out. Read page 7 — I-T-E CIRCUIT BREAKER CO.

141 Electric connections made easy, permanent

Cadweld butt connection eliminates wasted material. No drilling, no tinning, no maintenance. Can't loosen or corrode. Read page 46 — ERICO PRODUCTS, INC.

506 Instrument transformer theory, operation

Instrument transformer theory and operation are discussed in Bulletin 61S8528. Fully indexed bulletin covers transformer function, types, polarity markings, insulation, impluse protection, accuracy. Includes useful ratio-phase angle correction chart. Twenty-four pages. ALLIS-CHALMERS MANUFACTURING CO.

405 How to plan control center

Bulletin SM244EFS gives useful tips on planning control center to suit your individual needs. Planning is simplified by three form sheets available from company. Bulletin pictures types of enclosures available, basic features. Sixteen pages. SQUARE D CO.

605 Electrical basics

Six-part series includes review of fundamental concepts of conductivity, resistance, magnetism. Reviews direct current and alternating current machinery, single-phase alternating current circuits, polyphase alternating current circuits. Fifty-two pages. Reprinted from INDUSTRY POWER. (50¢ per copy, stamps or coin, quantity rates on request.)

606 Unit switchgear off the shelf

Adroit engineering at Bridgeport Brass Co. permits tailor-made expansion of electric distribution system with standard, catalog-listed switchgear. Reprinted from June 1956 INDUSTRY POWER.

607 Power transformer tap settings

Graphic method helps you visualize voltage drops in your electric distribution system to predict best transformer tap settings. Reprinted from April 1953 INDUSTRY POWER.

608 Aluminum bus cuts installation costs

Ethyl Corp. engineers designed and built their own aluminum bus to transfer 30,000 dc amps from one rectifier station to another. Lightweight installation with aluminum cuts cost of supporting structures. Reprinted from October 1956 INDUSTRY POWER.

609 In-plant electric distribution system

Special industry report summarizes trends in distribution of electric power in industrial plant from point where power becomes available to points of utilization, prepared by INDUSTRY POWER staff editors. Special report from INDUSTRY POWER. (Single copies free — 2 to 24 copies, 25¢ each. Quantity prices on request.)

ELECTRIC UTILIZATION

406 Heat with electricity 101 different ways

Industrial electric heating applications and methods are described in 32-page Booklet, "101 Ways to Apply Electric Heat." Illustrated case histories show experience-tested ways to apply metal-sheathed Chromalox electric heating units in industrial jobs. EDWIN L. WIEGAND CO.

"No, I didn't object to having my office rewired, . . . but . . ."

ENGINES: DIESEL, GAS, STEAM

407 Mechanical specs on heavy-duty diesels

Bulletin 717-32158 describes heavy-duty diesel engines that may be used for powering heavy industrial machinery or for generating electricity. Available in four basic types: turbocharged, roots blown, naturally aspirated, or spark ignition (burns methane-type gas). Bulletin gives section drawing of turbocharged engine. Describes basic engine components and optional equipment available. Sixteen pages. CATERPILLAR TRACTOR CO.

FIRE PROTECTION

408 Checklist for explosion hazards

"Hazard Finder" is a checklist of 13 questions to help determine possible dangers in your plant from electrically ignited explosions of flammable gases, vapors, dusts, liquids, or other combustibles. In questionnaire form, evaluation of answers is in separate sealed section of bulletin. When all 13 questions are answered as they apply to your plant, evaluation of answers based on National Fire Protection Assn. findings are checked against your answers to point up any hidden dangers that may exist. Eight pages. CROUSE-HINDS CO.

610 Tailor-made fire protection

Safe fire protection should be an integral part of facilities it protects. One utility company accomplished this as part of expansion program. Reprinted from September 1955 INDUSTRY POWER.

FUELS AND FIRING EQUIPMENT

114 Combustion controls save fuel

Modern combustion control systems save fuel and labor, control smoke, protect against fumes. Let specialists chose a modern control system for your fuel burning equipment. Read page 38 — CLEVELAND FUEL EQUIPMENT CO.

120 Better coal, better service

High quality coals produced on C&O line are processed to your specifications. C&O gives prompt delivery. Read page 23— CHESAPEAKE & OHIO RAILWAY.

409 How to handle loose coal

Booklet CR-618-G, titled "The Money-Saving Way to Stock-out, Reclaim and Compact Coal," tells how to prepare an area to support stockpile, gives tips for safe and profitable stockpiling. "Select-o-graph" helps match coal-handling machinery to the haul requirements in stockpiling and reclaiming. Suggests equipment for short, medium, and long hauls. Describes on-the-job coal-handling performances. Twenty pages. CONSTRUCTION EQUIPMENT DIV., INTERNATIONAL HARVESTER CO.

611 Fire either coal or oil

Equipping boilers to fire either coal or oil permits taking advantage of fluctuating fuel prices, gives security of standby fuel in emergencies. Paper Manufacturers Co. can supply all the steam they need using either coal or oil. Reprinted from August 1956 INDUSTRY POWER.

612 Lp means loss protection

One company avoids shutdown terrors from fuel shortage with LP gas standby plant. Propane-air gas plant is described. Reprinted from November 1954. INDUSTRY POWER.

613 Get best coal buy for your company's money

Read how one company evaluates different coals for maximum fuel economy. Includes 12 charts to aid in coal comparison. Reprinted from September 1956 INDUSTRY POWER.

HEAT EXCHANGERS

103 Get faster cooling, use less water

Better heat transfer, constant full-capacity working, reduced water consumption mean money in your pocket. Read page 24 — NIAGARA BLOWER CO.

135 Save on heat recovery

Heat exchangers engineered to fit your needs pay for themselves from savings in recovered heat. Built for years of trouble-free service. Get advice from the experts on this money saving equipment. Read page 35 — HENSZEY CO.

(more on page 36)

responsible steam plant operators!

DON'T OVERLOOK THE ADVANTAGES WITH...

HENSZEY

Heat Exchangers

- Engineered to fit your needs.
- Savings in heat recovery quickly pay for equipment.
- Simplicity and economy of design.
- Built to last for years and years.

HENSZEY COMPANY • Dept. A • Watertown, Wisconsin

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NON-FLUID OIL

TRADE MARK REGISTERED

PREVENTS MOTOR 'BURNOUTS'

When common oil escapes from bearings and soaks motor windings, the result is generally a short circuit and a costly "burnout." NON-FLUID OIL is ideal for ring-oiling motors because it does not leak, creep, or throw out of bearings—so does away with short circuits from that cause.

Ordinary greases are equally undesirable for use in ball or roller bearing type motors. They will not lubricate until softened by frictional heat and leave gummy residues that develop fatty acids and waste power.

Motors lubricated with NON-FLUID OIL run steadily with cool bearings and clean frames. You save money, too, because NON-FLUID OIL lasts longer and needs less frequent application.

Send for a free testing sample of NON-FLUID OIL and informative Bulletin No. 504. State size and type of motor on which test will be made.

NEW YORK & NEW JERSEY LUBRICANT COMPANY

292 MADISON AVE., NEW YORK 17, N. Y.
WORKS: NEWARK, N. J.

1896 61 1957 YEARS OF LUBRICATION LEADERSHIP NON-FLUID OIL TO INDUSTRY

WAREHOUSES

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Charlotte, N. C.	Springfield, Mass.	St. Louis, Mo.

NON-FLUID OIL is not the name of a general class of lubricants, but is a specific product of our manufacture.

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HERE'S A **NEW** ANSWER TO INDUSTRY'S SPACE HEATING PROBLEMS

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STAINLESS STEEL DIRECT-FIRED HEATERS

- 10 sizes, 400,000 to 2,000,000 BTU
- gas, oil or dual-fuel burners
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- completely automatic operation
- practically no maintenance required
- ideal for primary or supplemental heating in all types of industrial building, new or old
- write for free bulletin giving complete details and specifications

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REZNOR
WORLD'S LARGEST-SELLING DIRECT-FIRED **UNIT HEATERS**

Reznor Manufacturing Company, 70 Union St., Mercer, Pa.

Save Time . . .
Have Lasting Concrete Repairs

Patching concrete floors. Tuck pointing masonry.

Ready-to-Use, **NON-SHRINK EMBECO PRE-MIXED MORTAR**

. . . Eliminates assembling, proportioning of materials. All ingredients accurately proportioned, thoroughly blended.

. . . Provides durable repairs because it (1) does not shrink upon hardening, (2) bonds tightly to old concrete and mortar, (3) has higher early and ultimate strength, (4) is dense, resists water and oil penetration.

FREE how-and-where-to-use folder. Write for it.

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DIVISION OF AMERICAN-MARIETTA COMPANY
the **MASTER BUILDERS** co.
CLEVELAND 3, OHIO TORONTO 9, ONTARIO

IP handy guide

. . . starts on page 32

INSTRUMENTS AND CONTROLS

137 Lowdown on control systems

Hays Corp. president reviews benefits of boiler plant control systems. Design and function of draft gage is explained. Read page 27 — The Hays Corp.

108 Red-reading mercury thermometers

Red-reading mercury thermometers are housed in extruded brass case. Ranges from 40 to 950 F or Centigrate equivalent. Read page 41 — Palmer Thermometers, Inc.

126 Liquid meters save waste

Liquid meters standardize quality, aid cost control, promote efficiency. Mail coupon for details. Read page 31 — Buffalo Meter Co.

115 Boiler water level controls

Magnetrol controls are extra safe, extra simple. Standard units to 750 F, pressures to 600 psi, single or multi-stage. Read page 3 — Magnetrol, Inc.

410 Do you have an instrumentation problem

Handy chart in Bulletin 57-687-297 helps you pinpoint solution to your particular instrumentation problems. Instruments and controls are grouped into units for measuring pressure, flow, temperature, level, and for gas analysis. Result of measurement may be transmitted electrically or pneumatically, indicated by direct or remote reading, or recorded electrically or mechanically. Bulletin includes mechanical specifications. Twelve pages. The Hays Corp.

614 Rent network analyzers for distribution problem

Modern network analyzers give fast, accurate solutions to problems of industrial electric distribution systems at reasonable cost. Renting an analyzer for a day or so can provide many plans for system improvement that could take months of top engineering time to duplicate. Reprinted from February 1957 Industry Power.

615 Television for industrial control

Television gives instantaneous view of remote occurrences for constant, saft monitoring. Can be used in a variety of monitoring jobs. Reprinted from December 1950 Industry Power.

616 Switch to centralized control

When can you justify discarding old, but still operating, equipment for new? Corn Products Refining Co. chose to switch to new centralized control. Reprinted from June 1956 Industry Power.

LUBRICATION

111 Get power you pay for

Right lubrication oils keep diesels running clean, prevent deposits, minimize ring and bearing wear. Read page 56 — The Texas Co.

110 Stop motor burnouts

Lubricate with Non-Fluid Oil for steady run with cool bearings and clean frames. Read page 35 — New York & New Jersey Lubricant Co.

617 Fuel oil Additives save

Additives can save fuel, cut down time, simplify maintenance. Learn how additives work, when they are most effective. Reprinted from December 1955 Industry Power.

MAINTENANCE ITEMS

100 Gaskets hold high pressures

Internal pressures that blow ordinary gaskets make Wilcox gaskets tighter in the joint. Elas-

"You see now why I recommended getting feedwater from that troutstream."

handy guide . . . starts on page 32

tic filling is the secret. Read page 50 — CHICAGO—WILCOX MFG. CO.

101 **Planned maintenance helper**

Boardmaster Visual Control gives graphic picture of your operations. Save time and money, prevent errors. Read page 38 — GRAPHIC SYSTEMS.

116 **Patch wears like iron**

Floor patch bonds tight to old concrete. Easy to apply, won't crack or crumble. Read page 44 — FLEXROCK CO.

121 **Keep motors running longer**

Periodic maintenance of commutators and slip rings is low-cost insurance against high-cost replacement. Read page 40 — IDEAL INDUSTRIES, INC.

122 **Concrete repairs last longer**

Embeco pre-mixed mortar bonds tight to old mortar, has lasting strength. Easy to use. Read page 36 — THE MASTER BUILDERS CO.

MATERIALS HANDLING (BULK)

618 **Control coal feed to dryers**

Screw-feed conveyors with all-electric adjustable-speed drives carry fine coal from storage bins to flash dryers in preparation process at Hanna Coal Co. plant. Tearsheet from March 1954 INDUSTRY POWER.

619 **Conveyors for hot materials**

Efficient, low-cost handling of hot bulk materials (over 400 F) demands careful selection of proper conveyor system components. Experience proves certain conveyor materials especially suited to severe conditions. Reprinted from September 1954 INDUSTRY POWER.

620 **Bulk handling as a business**

Case history tells how one California company processes bulk rubbish to salvage useful materials. Economical, dependable conveyor operation is vital to this process. Reprinted from December 1954 INDUSTRY POWER.

MECHANICAL POWER TRANSMISSION

621 **Dual variable pitch pulleys**

Variable pitch motor pulley mounted directly on motor shaft utilizes full motor speed. Variable pitch companion sheaves supplement adjustable motor pulleys, generally doubling range through which speed can be varied. Reprinted from June 1954 INDUSTRY POWER.

PIPING, TUBING, AND HOSE

131 **Seamless metal hose assemblies**

Use custom-constructed hose assemblies for your power system. All sizes available. Read page 47 — COBRA METAL HOSE.

PUMPING EQUIPMENT

102 **Dependable boiler feed pumps**

Boiler feed pumps are designed for dependability. Proven by year in, year out service. Read page 9 — DE LAVAL STEAM TURBINE COMPANY.

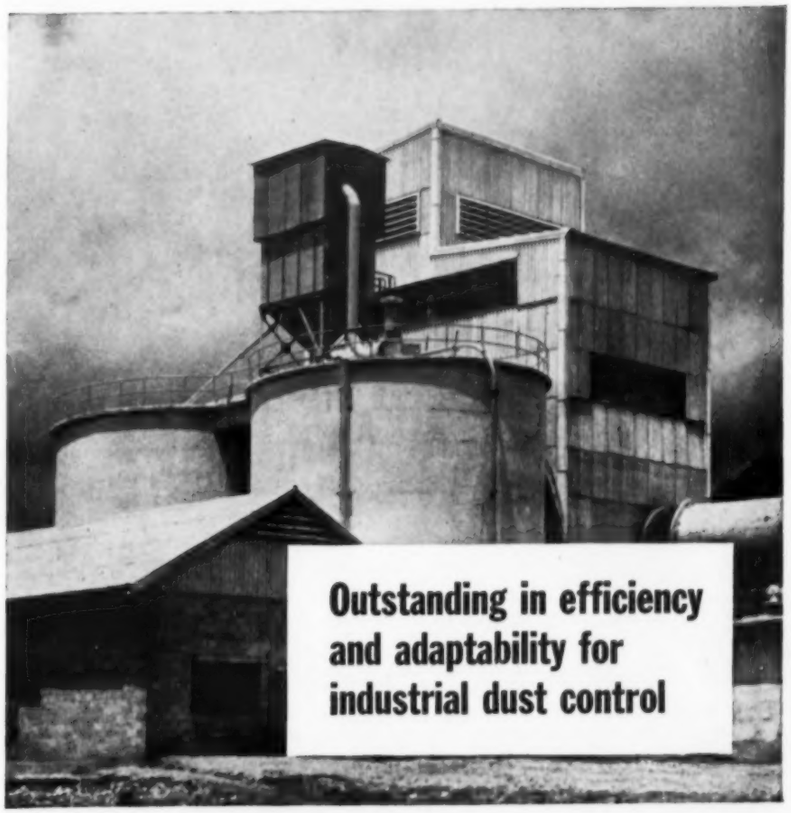
412 **Motor pump performance guide**

Catalog 107 covers Tuthill Type-SU pump units for handling heavy fuel oils and other noncorrosive, highly viscous liquids. Units deliver pressures to 300 psig, capacities to 2030 gph. Handy performance guides help you select best unit to fill any need. Dimensions, operating characteristics, pump and motor performance data included. Eight pages. TUTHILL PUMP CO.

413 **Maintenance-free mechanical seals**

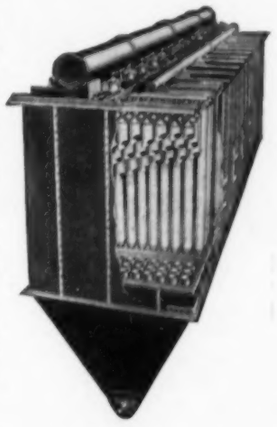
Mechanical seals and sealing systems for boiler feed pumps and hot water pumps are described in Bulletin S-230. Seals cut maintenance and downtime because they need no attention after installation. Closed circulating system provides cooling water in seal chamber. Mechanical seals and sealing systems are engineered to meet individual pump design and piping arrangement. Four pages. CRANE PACKING CO.

(more on page 50)



Norblo *Automatic Bag Type*
DUST ARRESTERS

Wherever it is important that you have continuous high recovery of industrial dusts and fumes — for salvage or for good housekeeping — Norblo Automatic Equipment brings you many design advantages.



Here is dependable heavy duty collection service at low cost of operation and maintenance that pays for itself quickly. The principle of cyclic bag shaking and cleaning has proved itself for outstanding efficiency. Adjustment for varying dust loading can be made in a few minutes without shutting down.

If you have a dust problem or dust creating process that needs control, write us for free suggestions based on experience of over 40 years.

Norblo also builds centrifugal and hydraulic dust collectors, cement air cooling systems, and portable type dust collectors.

The Northern Blower Company
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Norblo ENGINEERED DUST COLLECTION SYSTEMS FOR ALL INDUSTRIES

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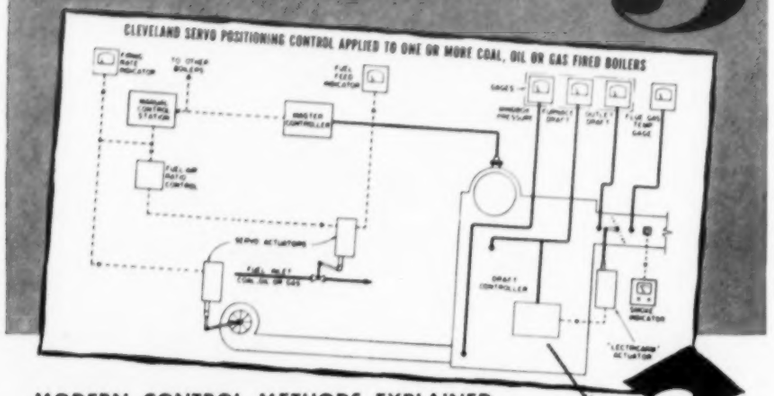
Free DETAILED SYSTEMS FOR COMBUSTION

AUTOMATION NO. 3 OF A SERIES



MODERN CONTROL METHODS EXPLAINED WITH SCHEMATIC ILLUSTRATIONS

Number 3 of a series of guides to "Automation in Combustion", this FREE Manual contains engineering data for solving combustion problems. Tells how fuel and labor savings, smoke control, added refractory and boiler life, protection against fumes and explosions are designed into Modern Combustion Control Systems.

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PANEL CONTROL CABINETS

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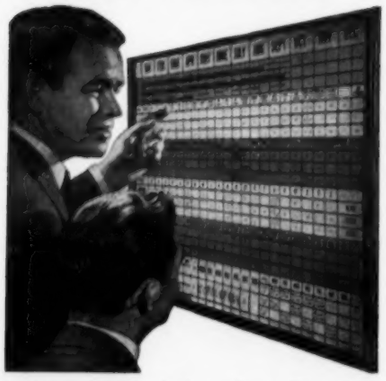
How To Get Things Done Better And Faster



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another reader service . . .

the LOCATOR

If you want information in a hurry about products and services available in INDUSTRY POWER'S field, turn to page 53. You will find a complete listing of every advertiser in this issue, with the page on which his advertisement appears and the local offices he has ready to serve you. This special service is another INDUSTRY POWER first, another way we save your time. Use the LOCATOR, it's designed for you . . .

It's on page 53.

Heating Idlewild

. . . starts on page 14

gpm capacity at 160-foot head. pump bearings are again water cooled, oil lubricated, ball-bearing type with cooling water going to the cooling towers as makeup water.

Pump glands are of special design. They have a special throat construction and lantern ring so that 240 F water from the return main can be used as a gland seal to prevent leakage and steam flashing. These pumps use the expansion tank as a suction source and pump water through four main distribution systems to the user buildings and return. Water leaves the plant at 380 F and returns at 240 F or higher, depending on terminal load requirements. Before entering the pump suction, 400 F water from the expansion tank is mixed with return water so that water enters the supply main at 380 F.

An interesting feature of the plant is the valve pit, directly in front of the building. Supply and return mains go into the pit through pipe trenches. The four main distribution zones are fed from these mains. By installing zone controls outside the plant building, the cost of enlarging the building to take additional equipment was saved. Since all piping leaving the plant had to be taken underground, provision had to be made for dispersion of the zone piping and some form of pit was necessary. Most return water from

American Gilsonite Co.

Pipes were laid on concrete slabs along entire length of trenches. Walls of concrete slabs were then built to confine pipes, insulation.

the distribution system goes to the boiler circulation pumps and directly to the boilers. When the amount of water circulated by the distribution system pumps exceeds that pumped by the boiler pumps, the excess goes into the expansion tank. When the water quantity pumped by the distribution system pumps is less than the amount circulated by the boiler pumps, all return water goes to the boiler pumps. A single internal supply and return line furnishes the necessary heat source to the refrigeration absorption machines.

Main pump glands are effectively sealed by pumping 240 F water from the return main through the glands and back to the return main. These Worthington gland-seal pumps have 55-gpm capacity at 235-foot head.

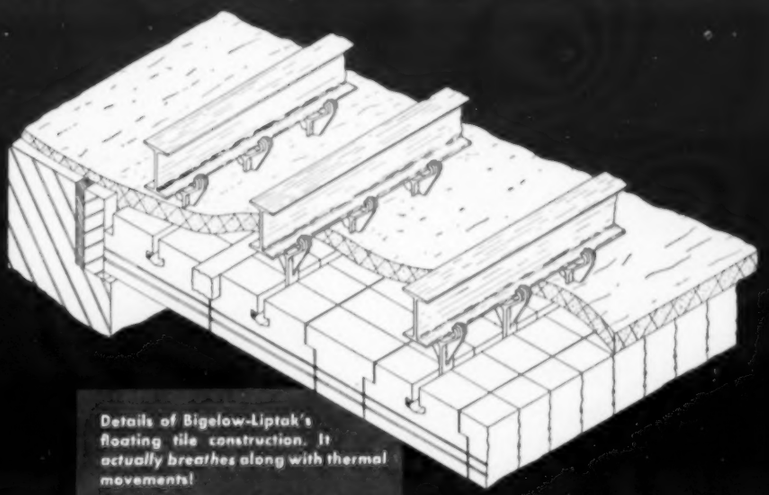
spheroid tank is main oil storage

A 210,000-gallon Horton spheroid main oil storage tank is located in a dyked area adjacent to the plant. The tank is approximately 41-ft dia and 33-ft high, and has a water drawoff connection, air vent, suction heater, and automatic float gage with remote indicator.

A shell and tube-type suction heater in the bulk storage tank has its head projecting through the tank to facilitate maintenance. The heater is capable of heating 1000 gpm of No. 6 fuel oil from 70 F to 100 F using 380 F water as heating medium. Oil withdrawn from the tank flows through the heater and is pumped by transfer pumps to the day tank. Hot water from the distribution system enters the heater after following the oil line route as a tracer, goes through the tubes, and returns to the distribution system return main. A temperature controller regulates oil temperature by controlling water flow through the tubes. A thermostatic element in the heater shell actuates the automatic water control on the return hot-water line.

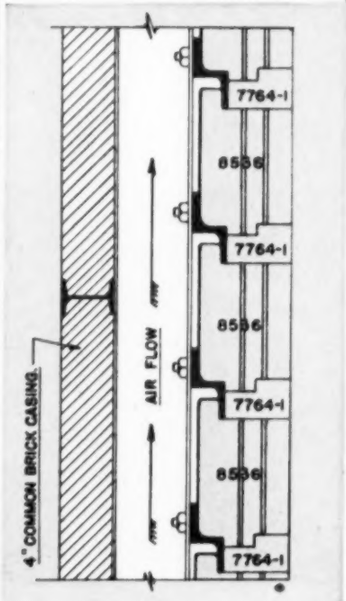
Transfer pumps for moving oil to the day tank are paralleled and are installed in a pumphouse at one end of the dyked area. The pumps are operated manually from the plant. Only one pump can be operated at a time. These positive displacement-type pumps have relief valves on the discharge that

Suburban Detroit's New Incinerator . . . .



Details of Bigelow-Liptak's floating tile construction. It *actually breathes* along with thermal movements!

TOUGHER THAN BLAZES!



Cross section of B-L's arch construction. Note how heavy, heat-resisting castings support the tile.

City planning engineers and consultants will be vitally interested in the fact that Bigelow-Liptak's unique, unit-suspended design for furnace walls and arches makes incinerators "tougher than blazes" too.

Proof of that fact lies in the many B-L installations which dot the country. Right now, in suburban Detroit, Michigan, a king-sized incinerator featuring B-L design is working around the clock.

In a nutshell, unit-suspended construction provides longer, trouble-free life at a lower, overall cost.

Here's why:

1. Each tile is individually supported—there's no "stacked up" burden caused by the ones above it. Thermal expansion is confined to individual tile. Mechanical spalling caused by pinching, buckling, etc. is eliminated. That adds up to no cumulative loading or expansion.
2. If repairs ever become necessary, any small section of tile can be removed and replaced without disturbing adjacent areas. This cuts the size of the repair job as all other areas—above, below, at the sides—need not be touched.

Remember: you'll pay less in the long run. Countless installations in boiler houses, oil refineries, metallurgical furnaces—wherever heat must be controlled—have proven that fact. Write for information—today.

BIGELOW-LIPTAK *Corporation*

and Bigelow-Liptak Export Corporation

13300 PURITAN AVENUE, DETROIT 27, MICHIGAN

UNIT-SUSPENDED WALLS AND ARCHES

In Canada: Bigelow-Liptak of Canada, Ltd., *Toronto, Ontario*

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How Good COMMUTATOR MAINTENANCE Saves Money

IT'S JUST LIKE CHANGING THE OIL IN YOUR CAR...

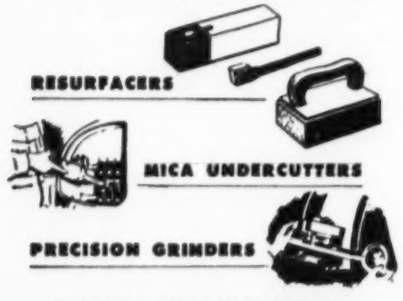
You do this regularly because it makes your car run better and last longer. The trifling expense protects you against loss.

It's the same with motors and generators. Periodic maintenance of commutators and slip rings is simply low-cost insurance against high-cost replacement, rebuilding and motor failure.

Keep Your Motors Running Longer at Lower Cost with

IDEAL PREVENTIVE MAINTENANCE

THE COMPLETE IDEAL LINE:



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Ideal Preventive Maintenance gives you everything you need to set up a preventive maintenance program that will save you many times its small cost. NO DISMANTLING OR TAKING EQUIPMENT OUT OF SERVICE WHEN IT'S NEEDED.

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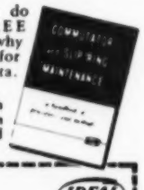

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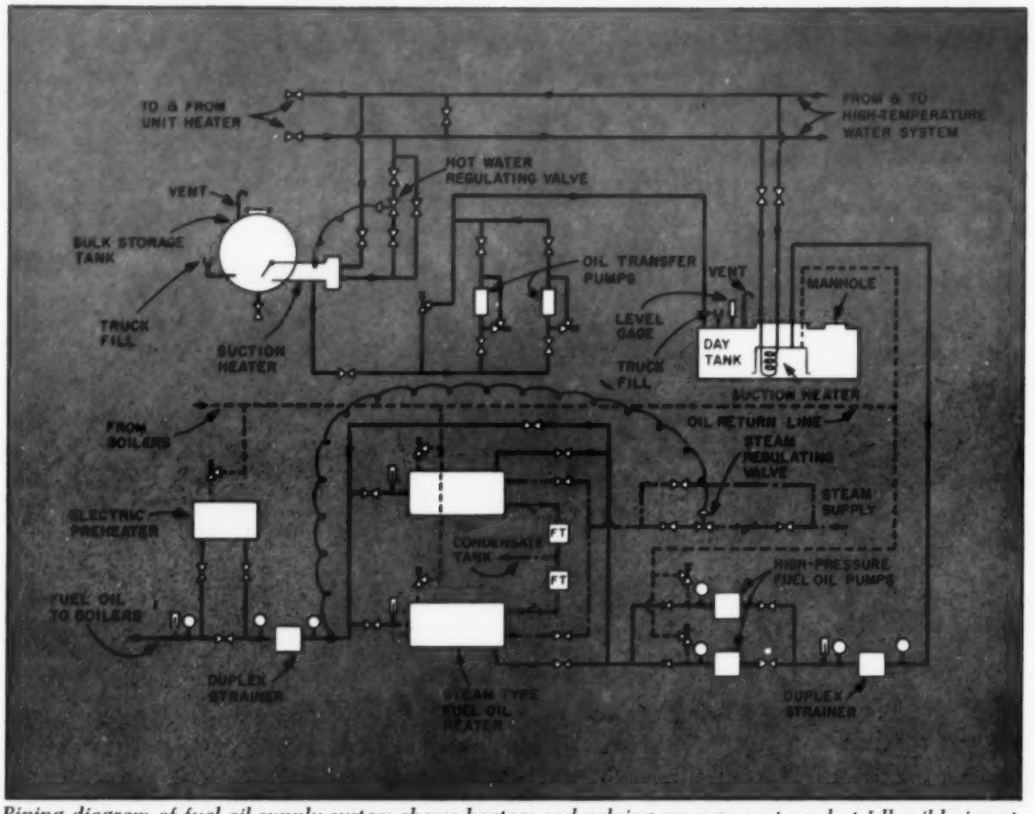
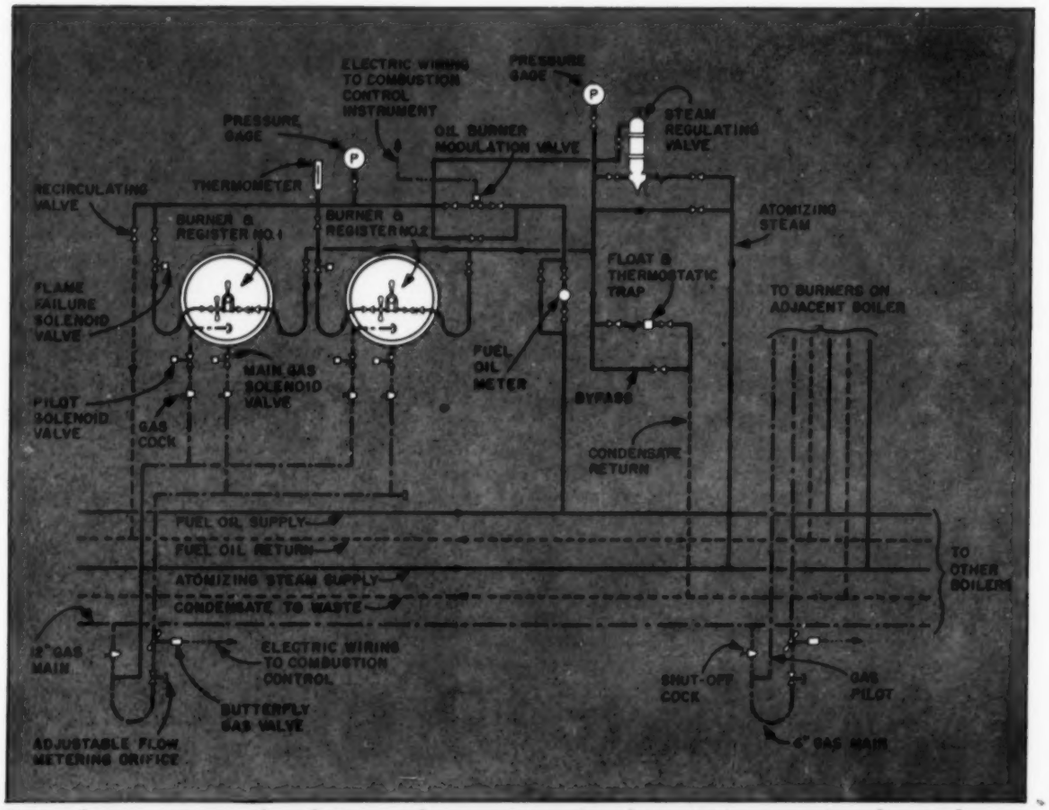
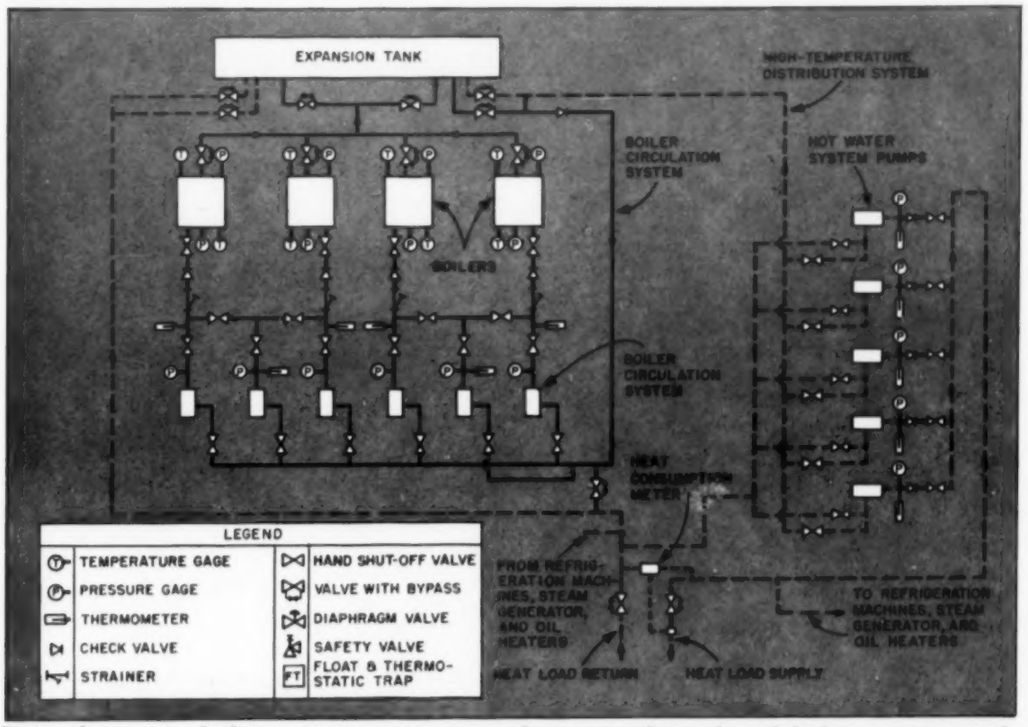


Piping diagram of fuel oil supply system shows heaters and valving arrangement used at Idlewild airport.



Piping diagram for gas, oil, and steam to burners. Steam for oil atomization comes from heat exchanger.



Piping diagram for high-temperature water system showing circulation through boilers, expansion tank.

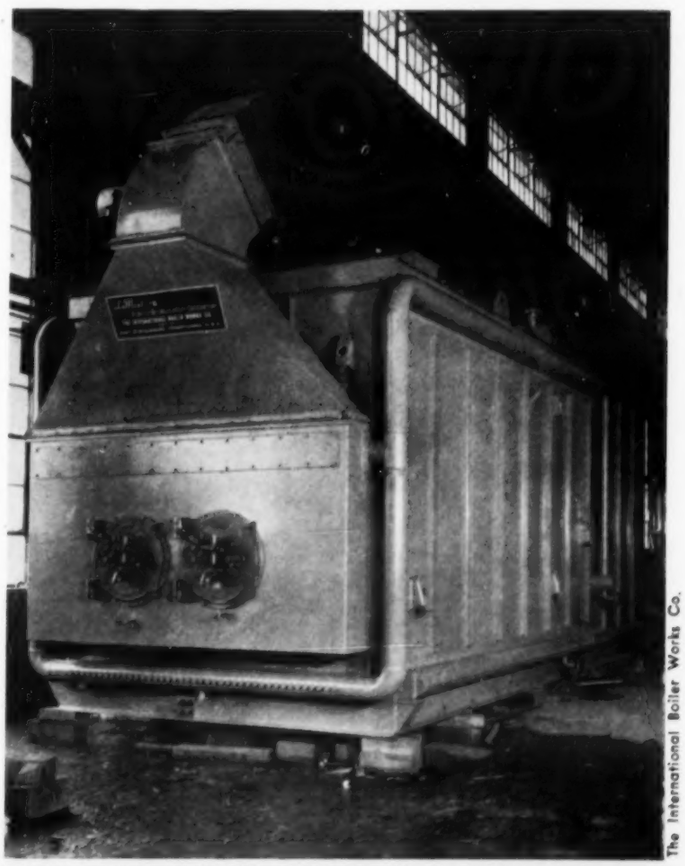
bypass to the suction line of each pump. An additional relief line in the bypass prevents excessive pressure developing in the suction line. Each pump is rated 105 gpm at 30 psig.

The 10,000-gallon day tank is buried adjacent to the plant. The tank has a truck fill line, a vent connection, a level gage connection, suction line for the oil pump sets, a discharge line from the bulk fuel transfer pumps, and a line for the various return and relief oil lines.

suction heater in day tank

Oil pump suction extends almost to the bottom of the tank, where a suction heater is provided. The suction chamber has a high-temperature water coil to heat the oil. Suction and fuel oil return lines are connected to the top of the chamber and oil from the tank enters the chamber through the bottom. All piping to the heater goes through the tank manhole cover to make servicing easier. The oil level indicator for the tank is on the plant wall near the boiler instrument panel.

A three-probe level controller is provided for the day tank. The high- and low-level probes actuate alarms or annunciators



The International Boiler Works Co.

Closeup of International-La Mont forced recirculation generator before shipment to Idlewild. Water circulates at 6 to 8 ft/sec.

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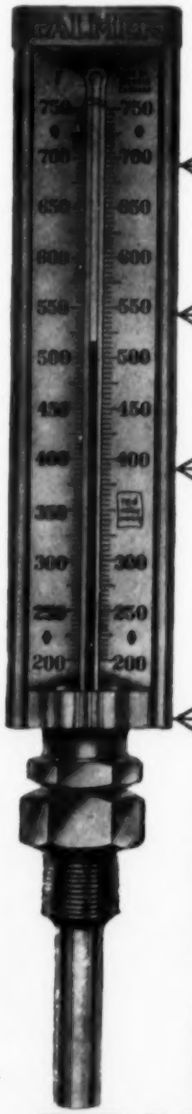

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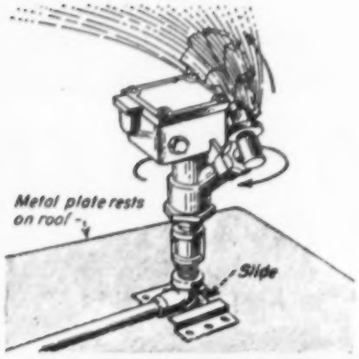

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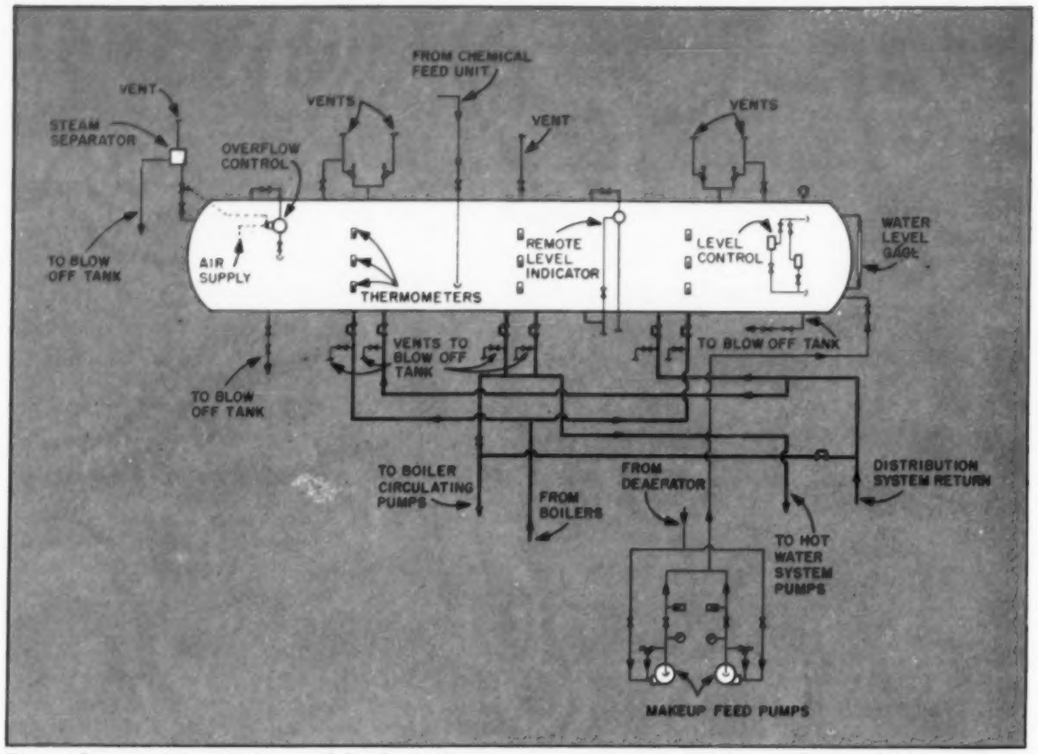
are we running out of water?

Read what Robert H. Morse, Jr. has to say about this vital raw material.

See page 13.



Piping diagram for expansion tank hook-up showing instrumentation. Tank is on boiler plant mezzanine.

on the boiler control board. The pump shutoff probe de-energizes the transfer pump starter if it is left on too long. It shuts down the pump before the high-level alarm sounds.

Oil for the burners is pumped from the day tank through a duplex strainer by one of the two high-pressure pumps in the oil set. The pump set is located in the rear of the boiler room. Pump starters with local start-stop pushbuttons are adjacent to the set, with an emergency stop button near the boiler room door. One pump has sufficient capacity for plant operation (40 gpm of No. 6 fuel oil at 250 psig), the other is a spare. Normally, the pumps are alternated.

fuel oil heaters have extra capacity

The pump discharges oil through two shell and tube-type fuel oil heaters. They heat 2400 gpm of No. 6 fuel oil from 100 F to 225 F with steam at 40 psig. The heater tubes are bayonet-type with steam flowing through the inlet steam chamber to the smaller of two concentric tubes and outward to the larger tube. Condensate is drawn off through the condensate outlet in the heater head, returning to the steam condensate system. Steam is supplied through a single steam line with a single steam flow regulating valve. Steam flow regulating valve is controlled by a thermostatic element in the oil discharge line from the heater. One fuel oil heater has sufficient capacity to supply all boilers operating at full output.

In the main discharge line from the heaters, a duplex strainer is installed with pressure gages at inlet and outlet. On the downstream side of the strainer, a 10-kw electric heater can provide heat if a completely cold start is necessary. Normally, the electric heater is bypassed.

In the pumphouse in the dyke

American Gilsonite Co.

After building walls around pipe, 1515 tons of Type B Gilsulate insulation was poured from bags to protect pipe against corrosion.

area, a gas service meter with a 12-inch main from the utility company supplies natural gas to the plant. A 12-inch line runs into the boiler room and a 6-inch branch line feeds gas to each burner. Each branch is equipped with a line shutoff cock, adjustable flow metering orifice, and a butterfly valve for automatic gas regulation to burner rings. From the 6-inch line, a smaller branch line extends to each burner. Each burner branch line has a manual gas cock and a solenoid valve, actuated by the Fireye control unit. A ½-inch line from the 6-inch line supplies the gas pilot. Each pilot line also is equipped with a solenoid valve actuated from the Fireye unit. The pilot is of the gas-electric ignition type and can ignite either the main gas burner or the oil burner. The ignition transformer is controlled and energized through the Fireye programming unit.

protection against flame failure

Fireye programming unit provides an integrated system of ignition, flame failure, safety interlocks, and complete programming of controls for each boiler. The Fireye unit has control cabinet, scanner unit, and local burner pushbutton stations. Scanner units monitor the pilot, oil, and gas flames. The system programs the actual starting sequence for both manual and automatic starts. It monitors all flames in the event of flame failure, operates in conjunction with boiler interlocks and limit controls, actuates gas and oil solenoids, and provides for visual and audible alarms. Any fault in the burner operating system will cause shutdown of the burner equipment as a safety measure. Only clearing the fault and resetting the unit will allow startup.

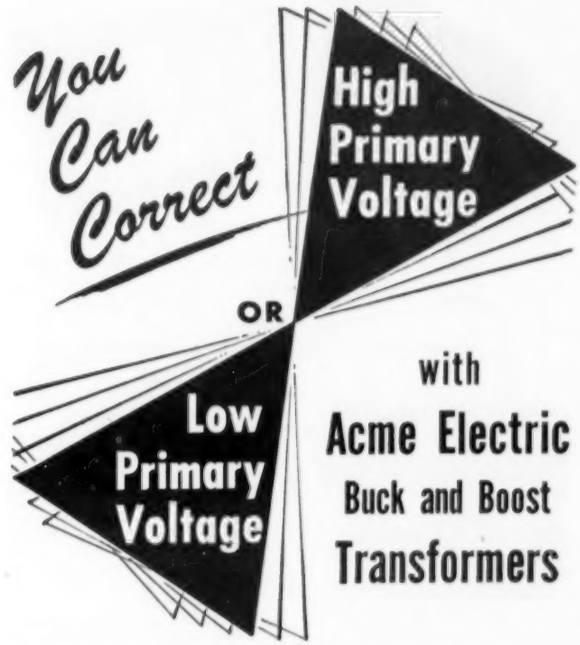
A steam generator in the rear of the boiler room supplies steam for various heating requirements in the plant and for atomizing fuel oil. It is a horizontal shell and tube unit, 10-ft long and 38-in. dia. Steam is generated in the shell as high-temperature hot water passes through the tube bundle. Steam flows to the heating and ventilating unit in the plant office area, to the deaerator for main boiler makeup water, to oil burners for atomization, and to fuel oil heaters. Condensate from the oil heaters and the heating and ventilating unit return to the condensate tank and pumping unit for return to the steam generator. Makeup water also goes to the condensate tank under float control. This is necessary because steam is lost in the deaerator and oil burners. A Pressuretrol, located in the steam generator drum, regulates water flow in the hot-water line to the generator, thus holding steam pressure to 60 psig. The condensate pump is controlled by a float level controller in the generator drum.

All makeup water for the high-temperature water boilers is softened and deaerated before being pumped into the main system. Two zeolite water softeners in parallel treat the water before it goes to the deaerator. While one unit is in use, the other unit is being regenerated.

High-pressure, high-temperature water is distributed through four main zones of underground piping to the user buildings. This piping runs at various elevations below the central oval-area grade. Utility lines, high-pressure fire lines, and various drainage and soil piping in the area caused frequent changes in new piping elevations to avoid interference. The hot-water piping is run in three lines for each zone. Any two lines can serve as the supply and return lines with the third line as a spare. The lines will be operated so that minimum load is imposed on the pumps.

six miles of underground pipe

Total length of hot-water piping is approximately 6 miles in underground distribution. Because of the rise and fall of the ground water level (due to the proximity of the ocean) and since the water is always very brackish, special care was taken to stabilize and protect the pipe. Hot-water lines are laid and anchored to a concrete pad. Precast lightweight slabs were used to form a U-shaped concrete pipe chase. Expansion loops were strategically placed to take up expansion and contraction in the lines and to take care of the varying changes in pipe elevation. Anchors and guides were placed as required for direction and anchoring of the lines. Gilsulate natural asphalt insulation was poured from bags over the lines and cured with high-pres-



Distribution of power, complicated by inadequate wiring, circuit voltage drop and improper transformer ratios, often result in excessive voltage at the point of use. Too frequently plants and commercial buildings with well engineered wiring systems, report circuit voltages as low as 88 volts and as high as 152 volts from which 115/120 volt electrical devices or equipment are intended to operate. If you're having constant trouble or poor performance from electrified office equipment, small power tools, lighting, or electronic devices — check your voltage as the principal source of trouble. Then correct voltage to normal with an Acme Electric Buck and Boost transformer.

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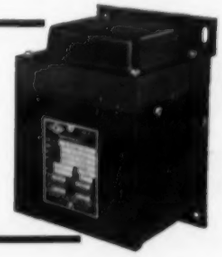
Correct the Voltage at Point of Use



By interconnecting primary and secondary windings of Acme Electric Buck and Boost transformers, circuit voltage can be reduced 10%, 13.32%, 20% or 26.64% on single phase circuits up to 152 volts, or increased 10%, 13.32%, 20% or 26.64% on single phase circuits as low as 88 volts. Also available for three phase applications for supplying nominal 230 volts from circuits above normal or below normal voltage.

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sure steam. After curing, the trench was back filled. Insulfil was used beneath the roads. During operation, the high-temperature water will keep the asphalt in a plastic state. The asphalt will act as an insulation and will also protect the pipe from external corrosion. The hot-water lines range in size from 4-in. to 10-in. dia, sized with sufficient allowance for expanded capacity. Standard pipe is used throughout.

A motor control center is the basic control for electric power to operating units. It includes the starters for various pumps in the systems. This center is located between the two wings of the building at the refrigeration floor level. Fuel oil pump starters, however, are located on the boiler room west wall.

instruments are mostly pneumatic

Control of instruments, controllers, recorders, and auxiliaries is mostly pneumatic with some electric instruments operated with pneumatic-electric controllers. Air for the controls is furnished by a compressor and tank set in the boiler room. The only completely electric system is the Hays boiler control system.

Basic control system of the whole plant is the combustion control system. Without boiler operation both summer and winter, the plant would be totally inoperative. Absorption refrigeration machines make boiler operation essential, although almost any hot fluid could be used as energy source.

The Hays Corp. combustion control system is a completely integrated electric system. Controllers measure temperatures, pressures, and flows through the boiler circulation system. Metering equipment has internal stabilizing devices to minimize sudden surges and deviations and to permit smooth operation. The system can be operated automatically or by remote manual control. By using controllers in combination with metering equipment, the necessary evaluation of conditions is automatically recorded for all parts of the system, and automatic correction for deviations from the set points is brought about.

boiler outlet temperature is constant

As fluctuations in heat load are recorded by the controllers, the gas- or oil-firing rate is immediately regulated. Firing rate of each boiler is also regulated so that boiler outlet temperature is kept constant. Throughout the full operating range, the system controls the fuel-air ratio by regulating the air for combustion to give maximum firing efficiency. With more than one boiler on the line, the controller distributes the heat load so that each boiler furnishes its proportionate share.

The flow and instrument panel at the front of the building contains all temperature and pressure gages for high-temperature water and chilled-water supply lines from the plant to the user buildings and for the corresponding return lines. It also shows the cooling tower water temperatures and pressures. Included on the board are recorders and integraters that indicate temperatures and flows of all fluids throughout the plant. This board enables the plant operator to see at a glance all load conditions being imposed on the plant and the amount of variation taking place per unit time. As a check on the length of time each absorption unit is on the line, an operating time recorder is installed on the board.

Supplying high-temperature water and chilled water as a year round operation will be a necessary part of the pattern for the central terminal area. With hot water being used for heating, domestic hot water, steam generation, and other uses, the hot-water lines will always be in use. Chilled-water lines will also be used in winter as well as summer — although at a much reduced rate — because loads in the user building will require some cooling. ♦ ♦

Design and Plant Construction

ARCHITECT: *Skidmore, Owings and Merrill; N. Y.*

ENGINEERS: *Seelye, Stevenson, Value & Knecht; N. Y.*

GENERAL CONTRACTOR: *The Foundation Company; N. Y.*

MECHANICAL CONTRACTORS: *Almirall & Company and the Norman Heating Co.*

ELECTRICAL CONTRACTOR: *The Plymouth Co.*

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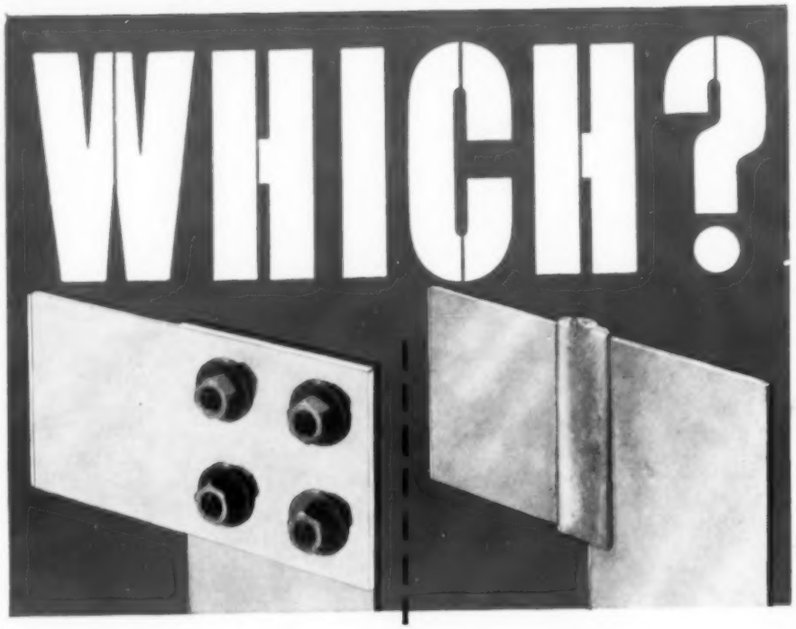

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Incinerators

. . . starts on page 20

In the Oakland County incinerator, certain hot walls are air cooled and cooler walls are effectively insulated. The secondary combustion chamber is an area that is air cooled. There are actually two tile surfaces in this area — holding tile and service tile to face the heat. When a burnout, occurs, only the 9-inch thick service tile need be replaced The rest of the incinerator is 7-inch single insulated walls.

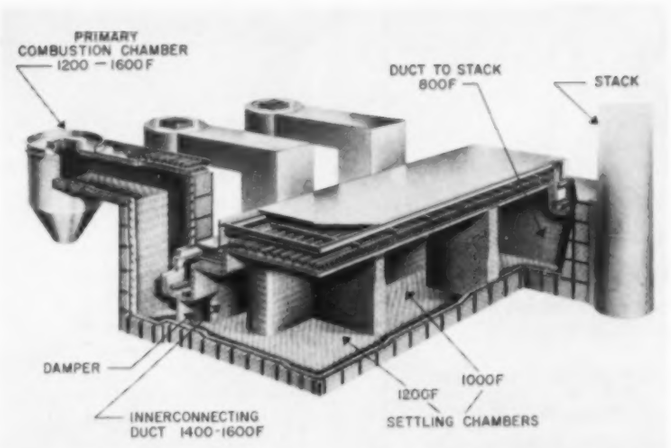
Unit-suspended walls are designed with ample offsets in all directions to provide tortuous paths against air leakage. Insulated walls are particularly airtight because of the three-ply insulation seal: a coating of plastic, one of block, and finally another coat of plastic applied over metal lath. No supporting castings penetrate the insulation. This minimizes heat losses and presents a smooth, even, unbroken exterior.

Hot furnace gases in the Oakland County Incinerator, move past a refractory damper into another duct and then via a twisting path into the settling chamber. Temperatures are gradually reduced until finally the gasses leave the stack — some 275 feet in the air — at about 800 F.

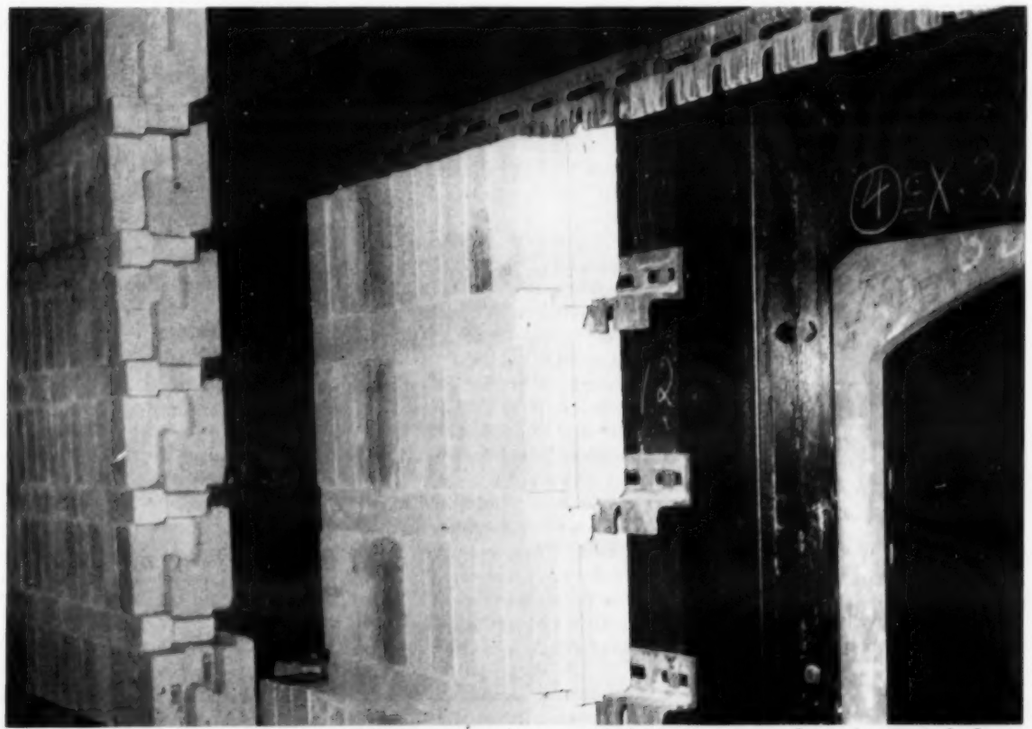
Settling chamber is equipped with a large vacuum cleaning system with a cyclone-type collector mounted outside the furnace. Flyash, paper particles and other incombustibles are removed from the collector periodically.

Far-sighted City planning, together with experienced engineering design and construction, has given the Southeastern Oakland County Authority trouble-free incineration with capacity for expansion. ♦ ♦

Specifications and design were handled by Greeley and Hansen, Chicago Consulting Engineers. Morse-Boulger Destructor Company, New York City, furnished the incinerator. Construction was by Bigelow-Liptak Corporation, Detroit, Michigan.



Cutaway shows gas flow and temperature limits throughout furnace.



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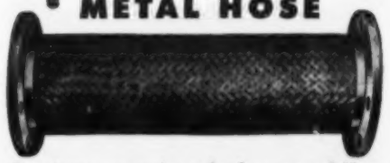

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Signed _____
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Crankcase oil

. . . starts on page 16

Crankcase Oil Specifications	
Specific gravity at 60F	0.897
API gravity at 60F	26.3
Viscosity SSU at 100F	235.2
Viscosity SSU at 180F	70.1
Viscosity SSU at 210F	50.0
Viscosity SSF at 122F	13.5

Purifier is a continuous centrifuge that discharges separated solids from nozzles located in the periphery of the revolving bowl. Thus, it is self cleaning. The bowl revolves at over 6000 rpm. Resulting high centrifugal force develops 1200-psi hydrostatic pressure at the discharge nozzles. As a result, the discharge rate of each nozzle is quite high. Although the bowl is equipped with 12 nozzle openings, normally six 1.0 mm (1/25 in.) nozzles are used for heavy-fuel purification. These six openings will discharge between 500 and 600 gph of sludge. Therefore, some fuel oil, as well as solids and water, also passes out through the nozzles. To prevent this oil from being lost with the sludge, the nozzle discharge is recirculated to the bowl bottom and directed to nozzle openings by the flush assembly. The flush assembly directs recirculated material into discharge nozzle openings and increases the amount of solids being discharged. This, in turn, decreases the amount of oil passing out with the separated sludge.

Oil present in the sludge is separated and discharges from the machine with purified oil. Sludge is concentrated to 25 to 50% BS&W content. Either periodically or continuously, a small quantity of concentrated sludge is drawn out of the system. Quantity of sludge drawn off will vary with type and BS&W content of the fuel being purified.

centrifuge test results were successful

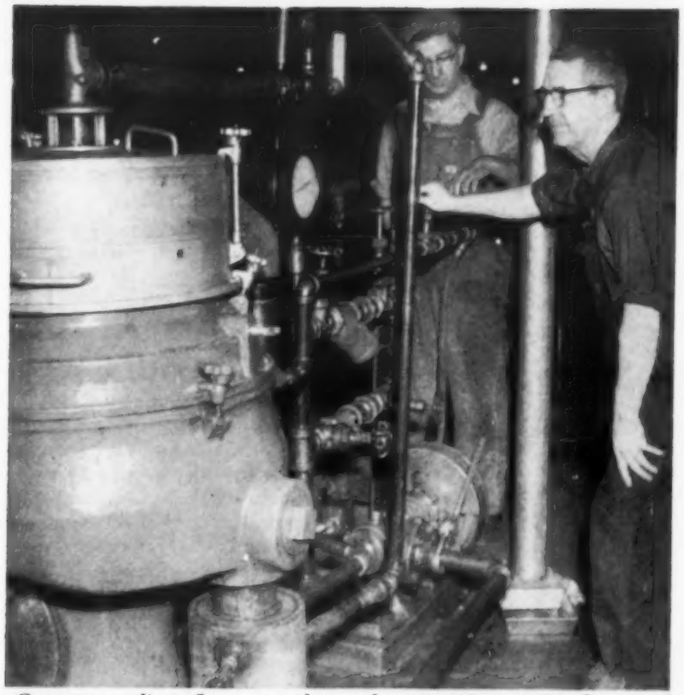
Crankcase oil has a relatively low viscosity and approximates the lower range of No. 5 fuel oil. Purification results were very good at both 400 gph and 800 gph capacities. BS&W content were reduced by over 95%, and sediment (by hot filtration) and ash were materially reduced. Also, approximately 80% reduction in lead content was achieved.

As a result of the excellent results obtained on the large-scale test run, the town purchased a De Laval AC-VO Nozzle-Matic continuous heavy-fuel

TABLE II — USED CRANKCASE OIL PURIFICATION RESULTS USING NOZZLE-MATIC CENTRIFUGE

	Oil as Received	*Purified Oil*	*Sludge Draw-off*
Specific gravity at 60 F	0.884	0.884	
API gravity at 60 F	28.6	28.6	
Viscosity SSU at 100 F, (sec)	244.0	242.0	
Viscosity SSU at 180 F, (sec)	63.0	63.0	
Viscosity SSU at 210 F, (sec)	52.2	52.2	
Viscosity SSF at 122 F, (sec)	16.0	16.0	
BS&W (ASTM D-96-52T) (% by vol)	5.0	0.24	25.0
Sediment, Hot Filtration (% by wt)	1.86	0.13	13.1
Ash at 550 C (% by wt)	1.71	0.49	12.2
Water by Distillation, (% by wt)	2.9	0.02	3.6
Sodium (Uranyl Acetate) (% by wt)	0.0066	0.0025	0.098
Sulphur, (% by wt)	0.572	0.566	0.613
Flash Point, Open cup. (F)	375	380	
Fire Point, Open cup. (F)	435	435	
Carbon Residue (% by wt)	0.70	0.69	0.75
Lead (PbO % by wt of Ash)	71.5	16.0	60.7

High lead content in purified oil indicates that lead is in solution and cannot be removed by mechanical separation equipment.



Operators adjust flow rate through centrifuge. Crankcase oil rates between 400 and 800 gph gives optimum oil cleaning.

purifier with necessary auxiliaries. This equipment was installed and placed in operation during 1956. Excellent results are being obtained. (Table II).

Experience at this time indicates that there will be no increase in engine maintenance using crankcase oil as fuel. It is necessary, however, to properly prepare crankcase oil for use as engine fuel by removing suspended solids. This preparation consists of heating, centrifuging, and filtering. Total cost is merely a fraction of a cent per gallon.

lead in solution presents problems

Excessive deposition on nozzle tips developed when engines were operated full-time on crankcase oil. These deposits caused smoking after 50 to 100 operating hours. It is believed that lead is responsible for these deposits. Lead, present in crankcase oil, comes from gasoline burned by the automotive engine. The centrifuge reduces lead content of the purified oil. A good portion of the lead, however, is in an oil soluble form and cannot be removed by centrifugation. One additive was found, after extensive tests, that seems to eliminate these deposits. Additive cost is negligible. Approximately one gallon is required for each 2000 gallons of crankcase oil.

Because of storage facility limitations, only four engines are operating on 100% crankcase oil at present. The remaining three operate on a blend of No. 2 fuel and crankcase oil.

tank settling system

Sludge separated from the crankcase oil is discharged from the centrifuge at a BS&W content of from 30 to 35%. From the machine it enters a 3000-gal tank where the heavier solids settle out. As additional sludge enters this tank, it displaces an equal amount of oil which overflows from a top outlet. Settled oil flows into a collecting tank and again passes through centrifuge. With this system, only about 25% oil is discarded with the final sludge. Discarded sludge and oil are used for spraying driveways, roads, and parking spaces.

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IP handy guide

starts on page 32

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The Editors

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Aug. 11-14:

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Aug. 28-30:

ISA National Gas Chromatography Conference; Michigan State University, East Lansing.

Aug. 28-30:

AIEE Pacific General Meeting; Pasco, Wash.

Sept. 4-6:

AIEE-IRE Technical Conference and Exhibit on Magnetic Amplifiers; Penn Sheraton, Pittsburgh.

Sept. 9-13:

ISA Instrument-Automation Conference and Exhibit; Cleveland Auditorium, Cleveland.

Sept. 9-13:

Illuminating Engineering Society National Technical Conference, Biltmore Hotel, Atlanta, Ga.

Sept. 23-25:

ASME Fall Meeting; Hotel Statler, Hartford, Conn.

Oct. 7-9:

ASLE-ASME Lubrication Conference; Royal-York Hotel, Toronto.

Oct. 7-9:

National Electronics Conference; Hotel Sherman, Chicago.

Oct. 7-10:

Federation of Sewage & Industrial Wastes Association Annual Meeting; Statler Hotel, Boston.

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Oct. 8-9:

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MINNEAPOLIS 6, MINN.: Blesi-Evans Co., 2803 Riverside Ave., FEderal 9-7019.
ST. LOUIS 3, MO.: O'Brien Equipment Co., 2832 Olive St., JEfferson 3-2091.
SOUTH BEND 23, IND.: Smith Monroe Co., 1912 S. Main St., ATlantic 6-6343.
WOOSTER, OHIO: Steam Economies Co., Quinby Bldg., HOward 2-8831.

BETZ LABORATORIES, INC. . .Page 11

PHILADELPHIA 24, PA.: (Home Office) Gillingham & Worth Sts.

BIGELOW-LIPTAK CORP. . . .Page 39

DETROIT 8, MICH.: (Home Office) 2550 W. Grand Blvd.

BUFFALO METER CO. . . . . .Page 31

CHICAGO 10, ILL.: Meters & Controls, Inc., 444 N. LaSalle St., WH 4-1448.
CINCINNATI 37, OHIO: Chapman Engineering Sales Co., 1717 Section Rd., ELmhurst 3140.
CLEVELAND 13, OHIO: Illes Power Control Co., 22700 Shore Center Dr., REdwood 2-9300.
DES MOINES 9, IOWA: Deco Engrg. Products, 1112 Locust St., 8-5721.
DETROIT 12, MICH.: Metrol Co., 7145 E. Davison. TWinbrook 3-6300.
INDIANAPOLIS 4, IND.: DeHaven Engineering Co., 1444 Consolidated Bldg., 115 North Penn. St., MElrose 2-2563.
KANSAS CITY 14, MO.: Economy Equipment Co. 7341 B'way, JAckson 3-1010.
KNOXVILLE 5, TENN.: Leinart Engineering Co., 412 E. Fifth Ave., 5 0363.
MEMPHIS 3, TENN.: C. J. Gaskell Co., Inc., 216 N. Lauderdale Ave., 8-2241.
MILWAUKEE 4, WIS.: Geo. H. Fredricks & Co., Inc., 4385 N. Green Bay Ave., COncord 4-1070.
MINNEAPOLIS 2, MINN.: Berry Ervin Engineering Co., Builders Exchange Bldg., FEderal 2-8861.
ST. LOUIS 8, MO.: Economy Equipment Co., 4526 Olive St., FOrest 7-5328.

CHAPMAN VALVE MFG. CO. . .Page 6

INDIAN ORCHARD, MASS.: (Home Office)

CHESAPEAKE & OHIO RAILWAY . . . . . .Page 23

DETROIT 2, MICH.: W. F. Pye, Fuel Service Engineer, C & O, 7-150 General Motors Bldg.

CHICAGO-WILCOX MFG. CO. . . . . .Page 50

CHICAGO 19, ILL.: (Home Office) 7725 S. Avalon Ave.

CLEVELAND FUEL EQUIPMENT CO. . . . . .Page 38

CHICAGO 1, ILL.: Mannle Engineering Co., 360 North Michigan Ave., Suite 401, RA 6-1114.
CINCINNATI 23, OHIO: Ray Heat & Power Co., 5510 Colerain Ave., MU 1-4412.
CLEVELAND 3, OHIO: Slawson Equipment Co., 1792 E. 40th St., EX 1-7263.
COLUMBUS 21, OHIO: Robt. A. McGovern Equip. Co., P.O. Box 5844, Upper Arlington Branch, CA 8-4922.
DES MOINES 9, IOWA: Midwest Controls Co., 1010 Cherry St., AT 2-1112.
DETROIT 20, MICH.: D. T. Randall & Co., 530 Livernois Ave., JO 6-7130.
GENESEO, ILL.: P. R. Deane Co., 109 Exchange St., 2153.
INDIANAPOLIS 2, IND.: Indiana Heating Corp., 1529 N. Pennsylvania St., ME 4-7112; and Keith Merrick, Box 6535.
KANSAS CITY 6, MO.: Hinds & Associates, Inc., 1430 Walnut St., HA 1-4145.
KNOXVILLE 17, TENN.: Gas Equipment Engineers, Inc., 501 Randolph St., N.E., 4-1871.
LOUISVILLE 3, KY.: Thompson-Kissel Co., 1615-17 W. Market St., JU 4-0327.
MILWAUKEE 14, WIS.: Heat & Power Co., 812 So. 60th St.
MINNEAPOLIS 9, MINN.: Engineered Sales Co., 314 W. 38th St., TA 4-0696.
PEORIA, ILL.: Industrial Fuel Systems Co., 2309 South Adams St., 4-2420.
ST. LOUIS 10, MO.: B & B Combustion Equip. Co., 4030 Chouteau Ave., NE-0135.
WEBSTER GROVES 19, MO.: Components & Equip. Co., 501 Clark St., WO 2-2799.

COBRA METAL HOSE, DIV. OF DK MFG. CO. . . .Page 37

CHICAGO, ILL.: Power Transmission Equipment Co., 1245 West Fulton St.
CLEVELAND, OHIO: Koehler Rubber & Supply Co., 3865 Carnegie Ave.

COPPUS ENGINEERING CORP. . . . . .Page 40

WORCESTER, MASS.: (Home Office) 262 Park Ave.

DEARBORN CHEMICAL CO. .Page 33

CHICAGO 43, ILL.: A. W. Johnson, 1840 W. 105th St.
CHICAGO 54, ILL.: E. W. Houseknecht, A. R. Tanis, Dearborn Chemical Co., Mechandise Mart Plaza.
CINCINNATI 8, OHIO: D. D. Powers, 1128 Paxton Ave.
CLEVELAND 28, OHIO: J. W. Fisher, 17020 Glendale Ave.
DETROIT 35, MICH.: J. H. Alm, T. W. Mack, 18954 James Couzens Hwy.
EARLVILLE, ILL.: J. P. Byrnes, R. R. #3.
EAST LANSING, MICH.: T. J. Weisbruch, 648 Gunson St.
EASTLAKE, OHIO: J. R. Fletcher, 281 Willowick Dr.
FLORISSANT, MO.: C. D. Schroeder, 435 Larry Dr.
GREEN BAY, WIS.: R. H. Fritschel, 920 Meacham.
HILLSIDE, ILL.: T. Zaggy, 4511 Jackson Blvd.
INDIANAPOLIS 3, IND.: G. B. Thurston, 4101 E. Naomi St.
JASPER, IND.: H. Beyersdorf, Jr., 115 East Fourth St.
KANSAS CITY, MO.: E. W. Roberts, 5827 Wabash.
MARIETTA 7, OHIO: J. A. Crenner, 519 Adams St.
MARION, OHIO: R. J. Maginn, 140 Clover Ave.
MINNEAPOLIS 24, MINN.: R. T. Moran, 5409 Mirror Lakes Dr.
NASHVILLE 4, TENN.: G. E. MacLean, 3503 Rainbow Place.
ROCK ISLAND, ILL.: R. O. Benson, 4009-22nd Ave.

DE LAVAL STEAM TURBINE CO. . . . . .Page 9

TRENTON 2, N. J.: (Home Office) 857 Nottingham Way.

ENGINEER CO. . . . . .Page 28

CHICAGO 4, ILL.: George J. Zanke, 53 W. Jackson Blvd., HArrison 7-5848.
CINCINNATI, OHIO: Fred Ellman, 1013 Fed. Reserve Bank Bldg.
CLEVELAND, OHIO: Ashmead-Danks Co., 316 Marion Bldg. MAin 1-6192.
DETROIT 2, MICH.: Agren Ascher Co., 5-121 Gen. Motors Bldg.
KANSAS CITY 11, MO.: Hughes Machinery Co., 4212 Main St., VAlentine 1-7021.
MEMPHIS, TENN.: Power Equipment Co., 1356 Madison Ave.
ST. LOUIS 8, MO.: Rhodes Equip. Co., 4485 Olive St.
ST. PAUL 1, MINN.: Commonwealth Electric Co., 417 Broadway, CApitol 4-1836.

ERICO PRODUCTS CO. . . . . .Page 46

CLEVELAND, OHIO: (Home Office) 2070 E. 61st Place.

FEDERAL SIGN & SIGNAL CORP. . . . . .Page 49

CHICAGO 19, ILL.: (Home Office) 8700 S. State St.

FLEXROCK CO. . . . . .Page 44

PHILADELPHIA 1, PA.: (Home Office) 3609 Filbert St.

FOSTER WHEELER CORP. . . .Page 33

CHICAGO 3, ILL.: 105 West Adams St.
CLEVELAND 14, OHIO: Leader Bldg.
DETROIT 26, MICH.: Michigan Bldg.
KANSAS CITY 5, MO.: Dwight Bldg.

GRAPHIC SYSTEMS, INC. . .Page 38

NEW YORK, N. Y.: (Home Office) 55 W. 42nd St.

THE HAYS CORP. . . . . .Page 27

MICHIGAN CITY, IND.: (Home Office) 742 E. 8th St.

HENSZEY CO. . . . . .Page 35

CHICAGO 7, ILL.: Himelblau, Byfield & Co., 1217 W. Washington.
CINCINNATI, OHIO: Carl G. Freudenberg, 5905 Red Bank Rd.
DES MOINES 12, IOWA: Elwood C. Giberson, 4110 Greenwood Dr.
DETROIT 27, MICH.: Herman C. Howell, 15720 Mark Twain Ave.
FERN CREEK, KY.: J. Zimmermann, P. O. Box 66.
GRAND RAPIDS 7, MICH.: Kress Engineering & Sales Co., 1342 Burton St., S. E.
INDIANAPOLIS 20, IND.: Young-Streeter Co., 6220 College Ave.
KALAMAZOO, MICH.: Max L. Young, Box 629.
KANSAS CITY 8, MO.: Fred N. Schadd, 3252 Roanoke Rd.
MEMPHIS 5, TENN.: C. J. Gaskell Co., 216 N. Lauderdale Ave.
PETOSKEY, MICH.: Jobber, Wm. Dunstan Supply Co., 555 Porter St.
ST. PAUL 1, MINN.: Commonwealth Electric Co., 417 Broadway.
WILLOUGHBY, OHIO: R. D. Murphy, 4815 Waidamere Ave.

HUNGERFORD & TERRY, INC. . . . . .Page 30

CHICAGO 4, ILL.: Ross Engineering, 224 S. Michigan Ave., WEbster 9-4721.
CLEVELAND 3, OHIO: R. D. Murphy, 6801 Euclid Ave., HEnderson 2-1900.
DETROIT 27, MICH.: Clifford B. Armstrong, Jr., 16817 Gr. River Ave., VE 8-4248.
INDIANAPOLIS 20, IND.: H. C. Ohge, 5324 Primrose Ave., BRoadway 7316.
KANSAS CITY 9, MO.: Parker & Foster, 3519 Troost Ave., JEfferson 4490.
LOUISVILLE 2, KY.: Allan K. Cook Co., 604 W. Main St., WAbash 1269.
MEMPHIS 5, TENN.: C. J. Gaskell Co., 216 N. Lauderdale Ave., ME 8-2241.
ST. LOUIS 10, MO.: Hudson Chem. Co. 4010 Chouteau Ave., JEfferson 1-7843.

IDEAL INDUSTRIES, INC. . . .Page 40

SYCAMORE, ILL.: (Home Office) 1006 Park Ave.

THE INTERNATIONAL BOILER WORKS CO. . . . . .Page 4

CLAYTON 5, MO.: Mechanical Works Engineering Co., 153 N. Meramec Ave., VOlunteer 3-6050.
CLEVELAND 12, OHIO: M. G. Limbach Co., 13231 Euclid Ave., POtomac 1-3530.
DAYTON 2, OHIO: Gary G. Schultz & Associates, 410 West 1st St., MI 0772.
DETROIT 7, MICH.: Bartels Heating Service, 1222 Bellevue Ave., LO 7-7217.

(more locator on page 54)

(Central Area)

the LOCATOR

. . . starts on page 53

FERN CREEK, KY.: J. Zimmermann, P. O. Box 66, FErn Creek 3315.
INDIANAPOLIS 5, IND.: N. R. Colbert, 609 E. 23rd St., WAlnut 3-5683.
KANSAS CITY, MO.: The Glennon Co., P. O. Box 2275, 210 W. 8th St., VI 2-0587.
MEMPHIS 5, TENN.: C. J. Gaskell Co., Inc., 216 Lauderdale Ave., JA 6-2241.
MINNEAPOLIS 6, MINN.: Philip R. Reese, Inc., 3747 Minnehaha Ave., PArkway 1-1673.
NASHVILLE 4, TENN.: Ryan Sales Co., P. O. Box 276, Phone 5-8584.
WATERTOWN, WIS.: Ernest A. Biefeld Engineering Co., Box 177, Phone 376.

I-T-E CIRCUIT BREAKER CO., SWITCHGEAR DIV. .....Page 7

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CINCINNATI 27, OHIO: 6953 Thorndike Road.
CLEVELAND 15, OHIO: 631 Hanna Bldg., 14th Street and Euclid Ave.
DETROIT 26, MICH.: Guardian Bldg., Room 1512, 500 Griswold St.
INDIANAPOLIS 4, IND.: Geo. A. Wright, 1211 Roosevelt Bldg.
KANSAS CITY, 5, MO.: Room 920, Dwight Bldg.
MEMPHIS, TENN.: Gregory-Salisbury & Co., Inc., 2523 Broad Ave.
MILWAUKEE, WIS.: Room 405, 210 Michigan Ave.
MINNEAPOLIS 3, MINN.: 326 Plymouth Bldg., Hennepin and Sixth St.
ST. LOUIS 5, MO.: 7 North Brentwood Blvd.

JOHNSON CORP. .....Page 32

THREE RIVERS, MICH.: (Home Office) 807 Wood St.
CHICAGO 6, ILL.: Barrett-Christie Co., 118 N. Clinton St.
CINCINNATI 36, OHIO: Graeme Robertson, 8400 Wicklow Ave.
CLEVELAND 14, OHIO: Tomlison Steam Specialty Co., 1599 St. Clair Ave.
DES MOINES 9, IOWA: Fred E. Triggs, 200 Plymouth Bldg.
DETROIT 3, MICH.: Merlo Steam Equipment, 1506 E. State Fair.
DULUTH 2, MINN.: Williams-Swanson Co., 208 Builders Exchange Bldg.
GRAND RAPIDS 2, MICH.: Hayden Supply Co., 41 Market Ave., S. W.
INDIANAPOLIS 9, IND.: Indianapolis Belting & Supply, 34 S. Capitol Ave.
KANSAS CITY 11, MO.: Hughes Machinery Co., 4212 Main St.
KNOXVILLE 17, TENN.: Dickey Engineering Co., 3009 Central Ave., N. W.
LOUISVILLE 2, KY.: Graft-Pelle Co., 309 W. Main St.
MEMPHIS 4, TENN.: Power Equipment Co., 1352 Madison Ave.
MILWAUKEE 4, WIS.: The Williams Engineering Co., 331 W. National Ave.
MINNEAPOLIS, MINN.: Blesi-Evans Co., 2803 Riverside Ave.
ST. LOUIS, MO.: O'Brien Equipment Co., 2832 Olive St.
SOUTH BEND 23, IND.: Smith-Monroe Co., 1912 S. Main St.
WOOSTER, OHIO: Steam Economies Co., Rm. 6 Quinby Bldg.

JOHNSON-MARCH CORP. ...Page 10

BIRMINGHAM, MICH.: J. H. Fortune & Son, 646 N. Woodward Ave.
CHICAGO, ILL.: Victor H. Jones Co., 100 W. Monroe St.
CLEVELAND 14, OHIO: McLean Company, 3525 Lakeside Ave.
CLEVELAND 15, OHIO: Hallman Company, 1900 Euclid Ave.
CHICAGO 4, ILL.: B. E. Schonthal & Co. Inc., 28 E. Jackson Blvd.
CINCINNATI 30, OHIO: J. H. Ballenger, 2067 Beechmont.
COLUMBUS 15, OHIO: United Equipment Co., 538 E. Town St.
CROSBY, MINN.: Stanley B. Troyer Co., Theatre Bldg.
DAVENPORT, IOWA: Ralph E. Little, 3215 Davenport Ave.
DAYTON 9, OHIO: Wm. J. Meyers, 3700 Hertland Drive.
DES MOINES, IOWA: Carl Grimes & Company, 1000 9th St.
DETROIT 7, MICH.: Wolverine Foundry & Supply Co., 3211 Bellevue Ave.
HERRIN, ILL.: J. W. Norton, 209 S. 18th St.
INDIANAPOLIS, IND.: Acme Engineering Agency, 2051 E. 46th St.
INDIANAPOLIS 20, IND.: R. B. Epperson, 5915 Indianola Ave.
KANSAS CITY, MO.: Hughes Machinery Co., 4214 Main St.
KANSAS CITY 6, MO.: Western Fuel & Supply Co., 12th & Walnut St. Bldg.
MILWAUKEE, WIS.: Dorner Company, Box 1000, 5341 N. Hollywood Ave.
MEMPHIS 17, TENN.: Walter H. Gay, 1024 S. Perkins Road.
SESSER, ILL.: Farrell Page, Box 504.
ST. LOUIS 8, MO.: Rhodes Equipment Co., 4485 Olive St.
TOLEDO 10, OHIO: Western Ohio Ventilating Co., 2909 Detroit Ave.

THE KIRK & BLUM MFG. CO. .....Page 26

CHICAGO 30, ILL.: Ken Jenson, 5939 W. North Ave., NAtional 2-1535.
DETROIT 2, MICH.: June & Co., 505 New Center Bldg., TR 1-7450.

THE JAMES LEFFEL & CO. ..Page 34

SPRINGFIELD, OHIO: (Home Office) 426 East.

MAGNETROL, INC. .....Page 3

CHICAGO 10, ILL.: Meters and Controls, 444 North LaSalle St., WHitehall 4-1448.
CLEVELAND 23, OHIO: Iles Power Control Co., 22700 Shore Center Dr., REdwood 2-9300.
CLINTON, IOWA: Meters and Controls Room 208, Johannes Bldg., CH 3-2033.
DAVENPORT, IOWA; Deco Engineering Products, 320 Western Ave., 7-6123.
DES MOINES 9, IOWA: Deco Engineering Prod., 1112 Locust St., 8-5721.
DETROIT 7, MICH.: Smith Instrument & Equipment Co., 1900 East Jefferson Ave., LOrain 7-3550.
GRAND RAPIDS 7, MICH.: Kress Engineering & Sales Co., 1342 Burton Ave., S. E., GLendale 2-9176.
INDIANAPOLIS 5, IND.: C. M. Buck, 2927 Central Ave., WAlnut 5-1832.
KANSAS CITY, MO.: Economy Equipment Co., 7341 Broadway, JA 3-1010.
MEMPHIS 5, TENN.: C. J. Gaskell Co., Inc., 216 North Lauderdale Ave., 8-2241.
MINNEAPOLIS 9, MINN.: Engineered Sales, 314 West 38th St., LOcust 0696.
MUSKEGON, MICH.: Smith Instrument & Equipment Co., 1466 Bearsley.
RIPON, WIS.: Yates Equipment & Supply Co., P. O. Box 331, BLack 600.
ST. LOUIS, MO.: Economy Equipment Co., 4526 Olive St., FOrest 5328.
TOLEDO 9, OHIO: Mason Equipment Co., 1601 Broadway, FUlton 4269.
CINCINNATI 8, OHIO: The Abbott Co., 3437 Michigan Ave., EA 1-2349.
COLUMBUS, OHIO: The Abbott Co., 1342 Highland St., AX 9-4244.
LOUISVILLE, KY.: The Abbott Co., 366 Francis St., JUniper 4-4713.

MASTER BUILDERS CO. ....Page 36

CLEVELAND 3, OHIO: (Home Office) 7016 Euclid Ave.

JAS. A. MURPHY & CO., INC. .....Page 34

HAMILTON, OHIO: (Home Office) Box 614.

NEW YORK & NEW JERSEY LUBRICANT CO. .....Page 35

CHICAGO, ILL.: N. Y. & N. J. Lubricant Co., 846 West Harrison Street.
CHICAGO 36, ILL.: J. N. Seng, 6151 S. Honore St.
CLEVELAND HEIGHTS 18, OHIO: G. W. Brenholts, 2328 Lamberton Road.
DETROIT, MICH.: A. A. Vogler, 4150 Haverhill Ave.
FORISTELL, MO.: A. H. Harlan, RFD 1, Box 191.
GREENSBURG, PA.: R. A. Henkel, 303 Center Ave.
LANETT, ALA. A. M. Cowan, Box 563.
SOUTH HILLS, COVINGTON, KY.: S. F. Britton, 1503 Henry Clay Ave.

NIAGARA BLOWER CO. ....Page 24

NEW YORK 17, N. Y.: (Home Office) 405 Lexington Ave.

NORTH AMERICAN MOGUL PRODUCTS CO. .....Page 55

CLEVELAND 13, OHIO: (Home Office) Standard Bldg.

NORTHERN BLOWER CO. ...Page 37

CLEVELAND 2, OHIO: (Home Office) 6500 Barberton Ave.

PALMER THERMOMETERS, INC. .....Page 41

CHICAGO 30, ILL.: Becker Engineering & Supply Co., 6539 N. Minnehaha Ave., ROdney 3-3187.
CINCINNATI 3, OHIO: Plant Equipment Co., Union Terminal Bldg., PA 1-6183 or GR 1-1552.
CLEVELAND, OHIO: H. R. Bowers, 1585 West 117th St., ACademy 1-8442.
DETROIT 27, MICH.: Industrial Instrument Supply & Mfg. Co., 14222 Robson Ave., VErmont 8-5940.
INDIANAPOLIS 8, IND.: Paller Engineering Co., 3025 N. Illinois St., TAlbot 5444.
MEMPHIS 12, TENN.: Engineered Instrument Sales Co., 2717 Union Ave., 33-1275.
MILWAUKEE 17, WIS.: Charles D. Haven, Jr., 5477 North Lake Drive, WOodruff 2-5139.
ST. LOUIS 20, MO.: Carl F. Gast Co., 6110 Garesche Ave., EVergreen 3-0750.
ST. PAUL 4, MINN.: John L. Schmidt, 1879 University Ave., NEstor 6383.

REZNOR MFG. CO. .....Page 36

CHICAGO 30, ILL.: 4652 W. Lawrence Ave., AVenue 3-3322.
CINCINNATI 6, OHIO: 1616 Madison Rd., CApitol 1-1400.
CLEVELAND 12, OHIO: 15963 Euclid Ave., LIberty 1-0663.
COLUMBUS 21, OHIO: Box 5844, Upper Arlington Branch, CApitol 8-4922.
DES MOINES 11, IOWA: Box 1091 U P Station, 5-4239.
GLENDALE 22, MO.: 876 Albert, (St. Louis, Mo.) YOrktown 5-6671.
GROSSE POINTE 36, MICH.: 315 Grosse Pointe Blvd., TUxedo 1-6086.
INDIANAPOLIS 20, IND.: 1077 East 54th St., CLifford 1-6121.
KANSAS CITY 6, MO.: 1322 Walnut St., Grand 0260.
LITTLE ROCK, ARK.: 1422 Battery St., FRanklin 4-0908.
MILAN, TENN.: Phone 940.
ROCK ISLAND, ILL.: 2130 Third Ave., 6-4495.
ST. PAUL 5, MINN.: 1694 Grand Ave., MIdway 9-3995.

RUPPRIGHT'S ROTARY ROOF COOLER .....Page 42

LOS ANGELES 43, CALIF.: (Home Office) P. O. Box 43555.

FRED H. SCHAUB ENGINEERING CO. .....Page 29

CHICAGO 11, ILL.: Albert Kral Co., 612 North Michigan Ave.
CINCINNATI 6, OHIO.: Crawford Power Equipment Co., 2904 Woodburn Ave.
CLEVELAND 28, OHIO: Crawford Power Co., 4130 Lee Rd.
GRAND RAPIDS 7, MICH.: Kress Engineering & Sales Co., 1342 Burton St., SE.
GROSSE POINTE WOODS 36, MICH.: The J. H. Comins Co., 1713 Anita Ave.
INDIANAPOLIS 1, IND.: R. M. Cherry Co., 5017 E. Michigan Ave.
INDIANAPOLIS 19, IND.: Noah M. Simmons Co., 5341 English Ave.
KALAMAZOO, MICH.: Kress Engineering & Sales Co., P. O. Box 629.
KANSAS CITY 6, MO.: S. C. McCann Co., 210 West 10th St., Rm. 612.
KNOXVILLE, TENN.: Boiler Supply Co., 601 South Central.
LITTLE ROCK, ARK.: Mullins Engineering Co., 524 E. Markham.
MEMPHIS 3, TENN.: T. J. O'Brien Engr. Co., 668 South Main St.
NASHVILLE, TENN.: Boiler Supply Co., 430 Craighead St.
PEORIA, ILL.: Howard O. Sprogle, 1011 West Main St.
RIPON, WIS.: Yates Equipment & Supply Co., P. O. Box 331.
ST. LOUIS 17, MO.: E. P. Harder Associates, 1702 McCready Ave.
ST. PAUL 4, MINN.: The John Hawe Co., 293 North Snelling Ave.
TOLEDO 3, OHIO: The Shaw-Kendall Engr. Co. P. O. Box 1736, 120 South Superior St.
WATERLOO, IOWA: Floyd D. Hays, 825 Franklin St.
WILMETTE, ILL.: Fred Thompson, 1637 Spencer Ave.

SORGEL ELECTRIC CO. .....Page 19

ATLANTA, GA.: Osgood & Associates, P. O. Box 7383-Station C. TRinity 5-7804.
BIRMINGHAM, ALA.: Osgood & Associates, Lyric Bldg., Rm. 508, AL 2-0181.
BUFFALO 21, N. Y.: C. V. Stevens, 5495 Main St., PLaza 0300.
CHICAGO 41, ILL.: L. L. Weldy & Associates, 4201 W. Irving Park Rd., Spring 7-8575 and 7-8576.
CLEVELAND 15, OHIO: Harvey E. Lakin, 3521 Euclid Ave., Endicott 1-6748.
COVINGTON, KY.: H. E. Bracke, 1053 Madison Ave., Hemlock 1-2299.
DAVENPORT, IOWA: Midwest Equipment Co. of Iowa, P. O. Box 532, 7-7074.
DES MOINES 14, IOWA: Midwest Equipment Co. of Iowa, 842 Fifth Ave., Cherry 3-1203.
DETROIT 35, MICH.: Wm. H. Yeomans, 15926 West McNichols Rd., Vermont 8-1808.
FORT LAUDERDALE, FLA.: W. Chester Smith, 207 E. Broward Blvd., JA 4-7172.
GREENSBORO, N. C.: Max I. Miller, P. O. Box 2826, 3-7955.
INDIANAPOLIS 20, IND.: Kyle G. Herder, P. O. Box 5952, Clifford 5-1361.
KANSAS CITY 8, MO.: Fleming & Co., 3021 Main St., Plaza 3-0111 and 3-0112.
LOS ANGELES 23, CALIF.: H. D. Easterbrook, 1264 South Boyle Ave., ANgelus 9-9421.
MILWAUKEE 2, WIS.: L. L. Weldy & Associates, 833 E. Kilbourn Ave., Broadway 3-6761.
MINNEAPOLIS 15, MINN.: Electrical Jobbers Equipment Co., 619 Fourth Ave., South Federal 6-6321.
NEW YORK 36, N. Y.: Elmer Richards, 141 E. 44th St., Rm. 512, OXford 7-7920.
NORFOLK 3, VA.: W. A. Bristol Co., 8725 Commodore Dr., JUstice 9-6114.
OMAHA 2, NEB.: Midwest Equipment Co. of Omaha, 1614 Izard St., AT 7600.
PHILADELPHIA 6, PA.: Clisby & Associates, 28 South Delaware Ave., WAlnut 2-2185.
PITTSBURGH 36, PA.: Wm. E. Wargo, 125 Green Drive, TUxedo 4-3977.
PORTLAND 9, ORE.: Fred W. Carlson & Assoc. 935 Northwest 12th Ave., Rm. 133, CA 8-3798.
QUINCY 69, MASS.: Kenneth F. McIsaac, 11 Campbell St., PR 3-7731.
ST. LOUIS 16, MO.: Charles H. Douglas, 4445 Gustine Ave., Flanders 1-1100.
SEATTLE 9, WASH.: Fred W. Carlson, 1201 Dexter Ave., ELliott 6630.
SHREVEPORT, LA.: Jack D. Clark, 2850 Bibb St., 6-9835.

TEXAS CO. .....Page 56

NEW YORK, N. Y.: (Home Office) 135 E. 42nd St.
CHICAGO 4, ILL.: 332 So. Michigan Ave.
INDIANAPOLIS 1, IND.: 3521 E. Michigan St.
MINNEAPOLIS, MINN.: 1730 Clifton Pl.

YARNALL-WARING CO. ....Page 12

CHICAGO 6, ILL.: Machinery Hall Bldg., Room 308, 549 W. Washington St., DEarborn 2-3191.
CINCINNATI 2, OHIO.: 307 East Fourth St., 710 Transportation Bldg., DU 1-7532.
CLEVELAND 14, OHIO: 737 National City Bank Bldg., MAin 1-6308.
DETROIT 21, MICH.: 18450 Livernois Ave., UNiversity 2-5280.
PHILADELPHIA 18, PA.: Chestnut Hill, CHestnut Hill 7-3117.
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Howard Building,
209 Post Street,
YUkon 6-2522

SOUTHEASTERN STATES
Joe H. Howell
1922 Greystone Road, N.W.
Atlanta, Ga.

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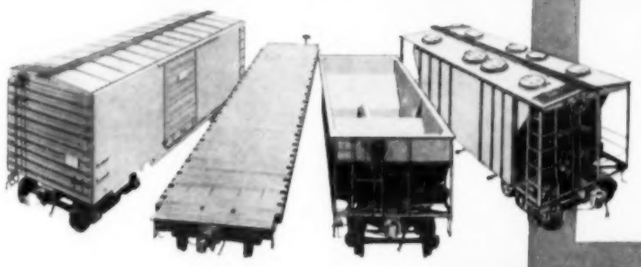

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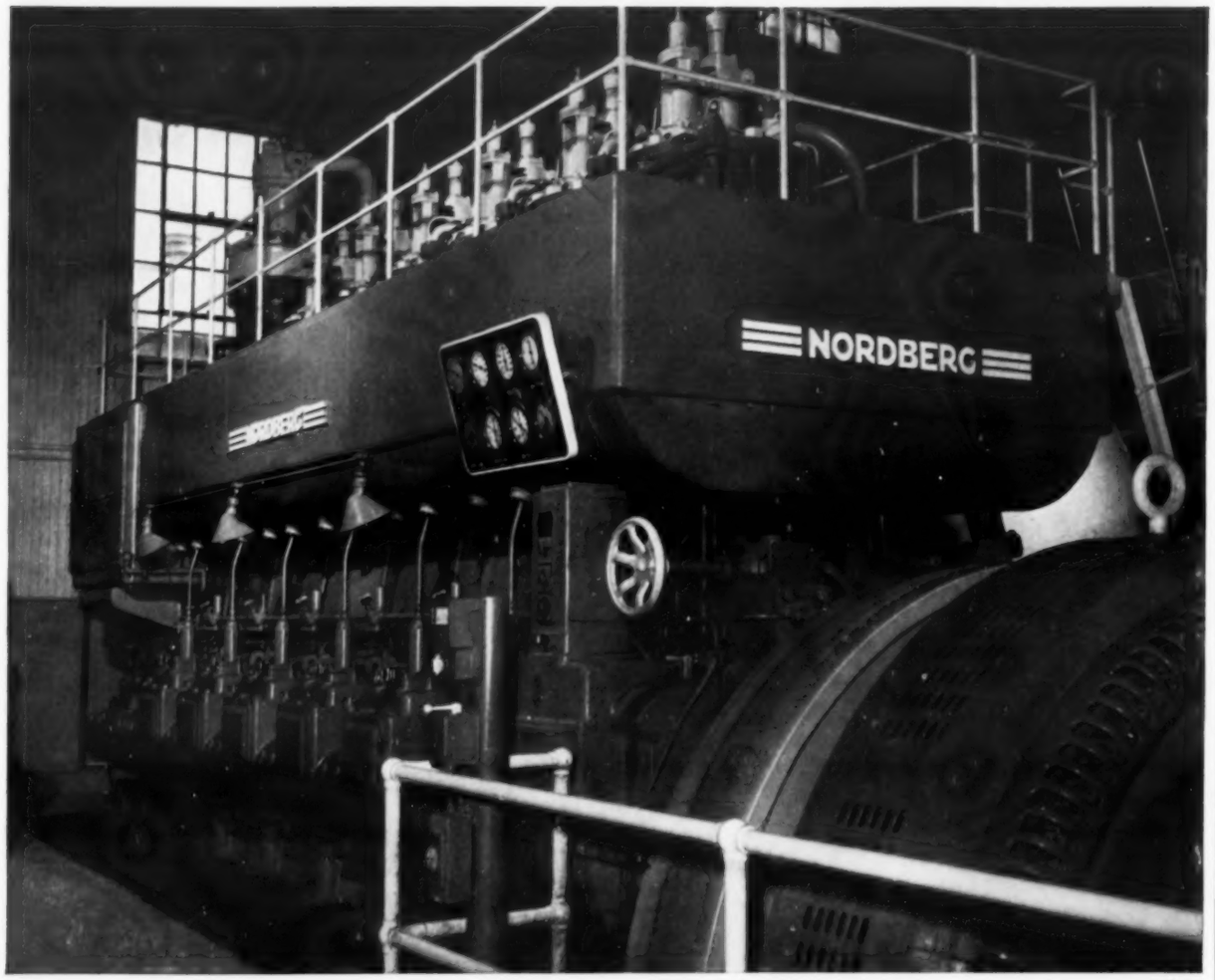

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